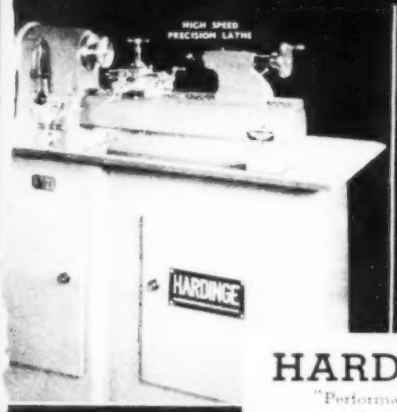
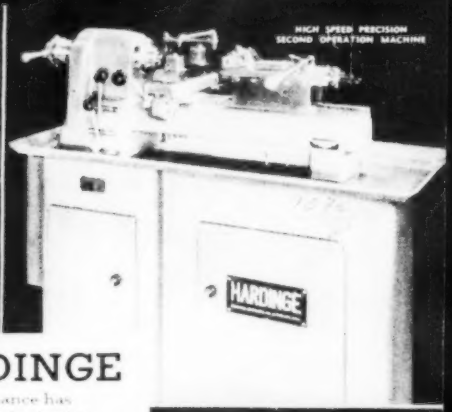
MACHINE TOOL BLUE BOOK

JANUARY 1942





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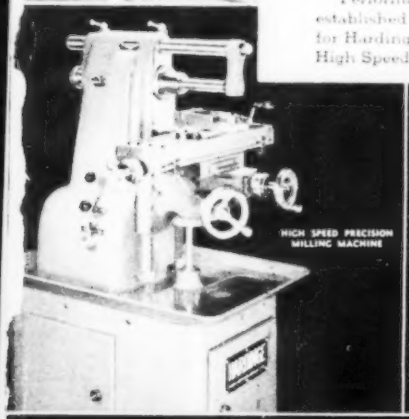

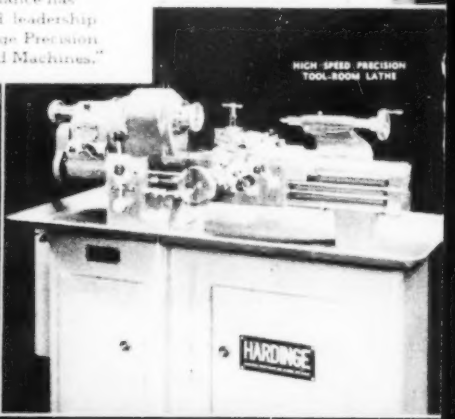

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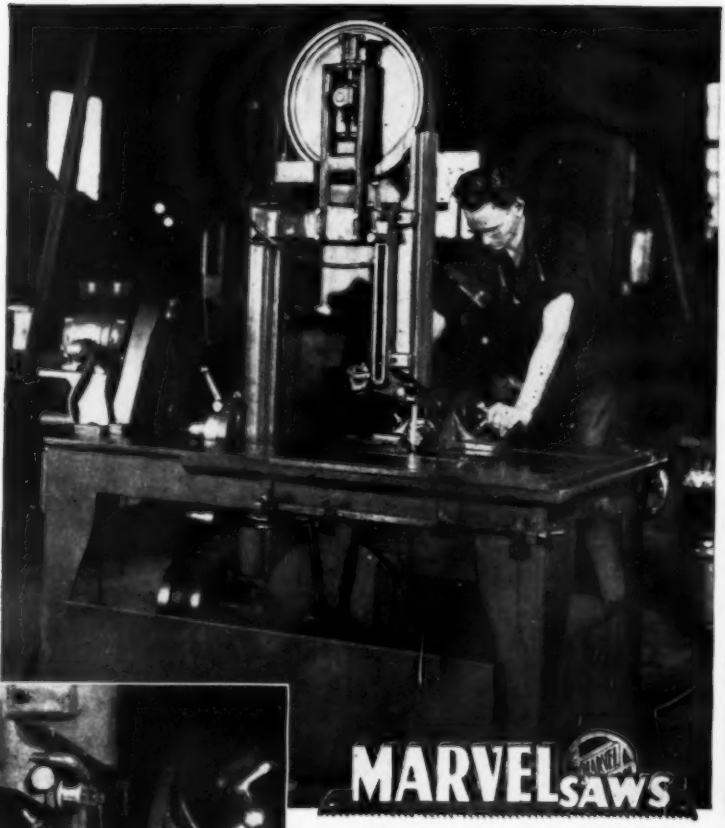

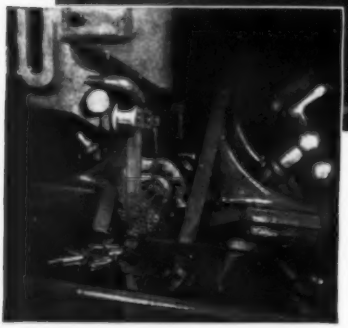

Cutting-off nested small diameter tubing—50 pieces per cut. On production jobs like this, the extreme accuracy and comparatively fine teeth of the blade produce smooth-edge, semi-finished pieces at very low cost.

MARVEL SAWS

"It has increased production about 30%" at Independent Pneumatic Tool Co.

Used to cut off a great variety of stock; cold drawn tubing (2335 S.A.E., 3115 S.A.E., and 3135 S.A.E.), angle iron, and round, hex and square bars in a wide range of sizes, this MARVEL No. 8 Metal-cutting Band Saw "has increased production about 30%" in the cutting-off department of the Independent Pneumatic Tool Co., Chicago.

The most versatile metal-cutting saw built, the MARVEL No. 8 is a truly universal tool. It handles work up to 18" x 18" cross section; cuts at any angle from 45° right to 45° left; does mitering, notching, saves warehouse delays and "cutting extras" and saves hours of machining by roughing work to size and shape.

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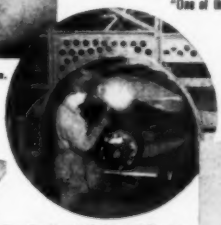

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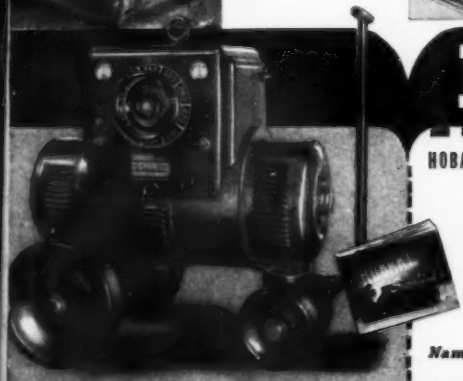

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When you use HARDINGE Collet Index Fixture units you will get more production from your old or new Milling Machines, Grinders, Shapers and Drill Presses. The 1" collet capacity, 20 or 24 hole index plate and 4" center height has a definite application to your tool room operations and inspection work. The index plate of the Horizontal-Vertical Collet Index Fixture has an arrangement whereby all holes may be "blanked out" except those required for a particular job—this eliminates indexing errors.

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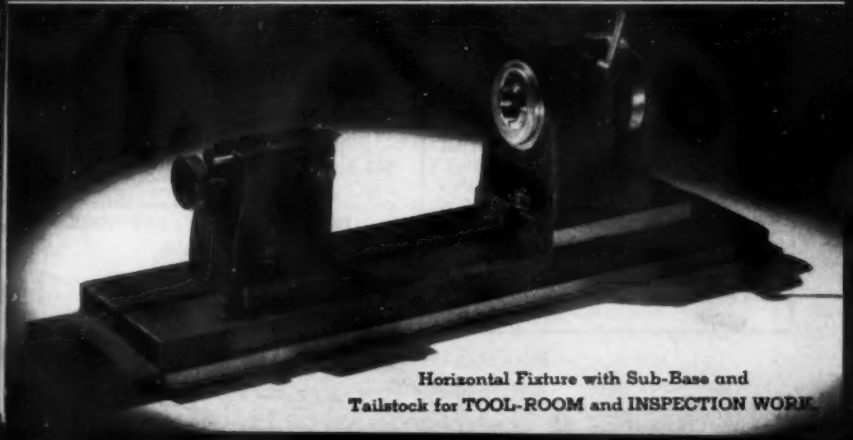
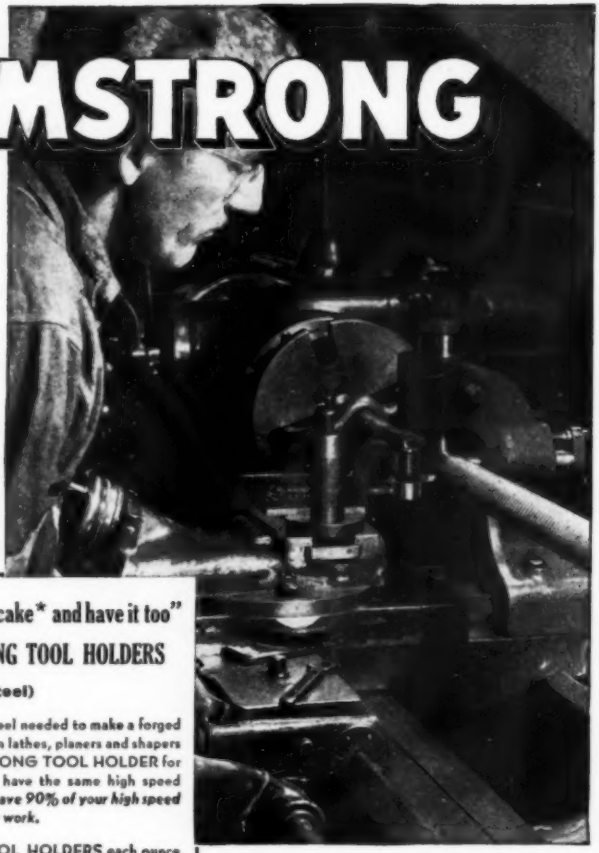
Ask for bulletin which describes many other features of these Hardinge Collet Index Fixtures.

HARDINGE BROTHERS, Inc. · · ELMIRA, N. Y.



Horizontal Fixture with Sub-Base and Tailstock for TOOL-ROOM and INSPECTION WORK

ARMSTRONG



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Take the high speed steel needed to make a forged tool for any operation on lathes, planers and shapers —by using an ARMSTRONG TOOL HOLDER for that operation you can have the same high speed cutting point *and still have 90% of your high speed steel left over for other work.*

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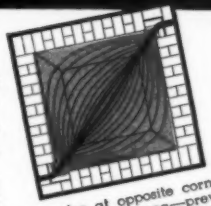
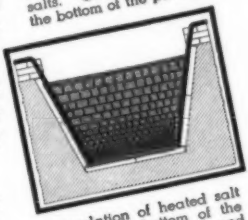
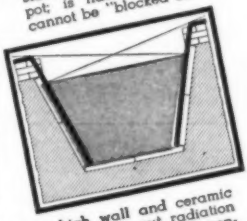


Electrodes at opposite corners—out of working area—prevent shorting work or "superheating" salts. Current spreads over the bottom of the pot and bath.



Full circulation of heated salt starts from the bottom of the pot; is natural, normal and cannot be "blocked off".



Extra high wall and ceramic brick lined pots cut radiation losses—improve working conditions. Users report over 8,000 hours continuous operation at all temperatures.

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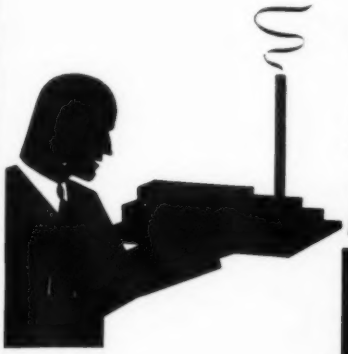

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Yet he has many factors in his favor: low overhead, specialized knowledge and a compact, flexible organization that can turn quickly to new work. Where additional machines are needed to handle war time work, versatile Jones & Lamson equipment is available.

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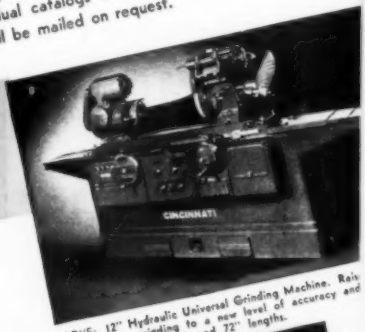
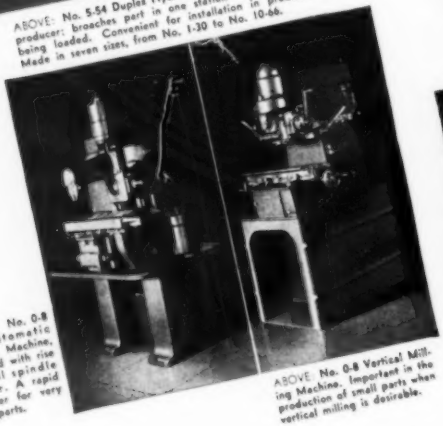
INCREASED industrial activity, both in the emergency and standard classifications, often presents unusual opportunities for reducing unit costs. Perhaps you can find many such opportunities in your own shop. In the fields of milling, grinding, broaching, lapping, die sinking, and cutter sharpening, machines bearing the CINCINNATI trade-mark will go a long way in helping you to lower your shop costs. Individual catalogs on any of our standard machines will be mailed on request.

ABOVE: No. 5-54 Duplex Hydro-Broach Machine. A continuous producer; broaches part in one station while other station is being loaded. Convenient for installation in production line. Made in seven sizes, from No. 1-30 to No. 10-66.



ABOVE: 12" Hydraulic Universal Grinding Machine. Rais and job shop grinding to a new level of accuracy and Made in 24", 36", 48", and 72" lengths.



RIGHT: No. 0-8 Plain Automatic Milling Machine, equipped with rise and fall spindle carrier. A rapid producer for very small parts.

ABOVE: No. 0-8 Vertical Milling Machine. Important in the production of small parts when vertical milling is desirable.

ABOVE: No. 1-12 Plain Automatic Milling Mac For shops where high production of parts is an important factor. built in No. 1-18 siz

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TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER GRINDE

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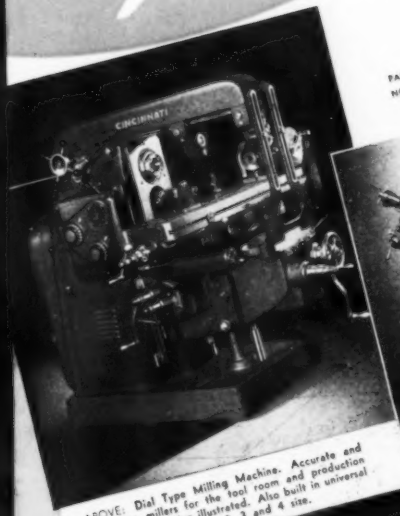


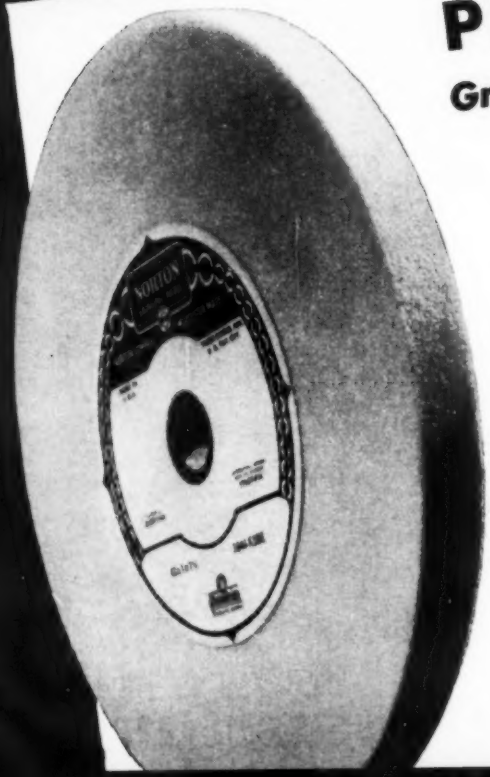
ABOVE: Dial Type Milling Machine. Accurate and productive millers for the tool room and production shop. Plain machine illustrated. Also built in universal and vertical styles, Nos. 2, 3 and 4 size.

LEFT No. 2 Centreless Grinding Machine. Slashes grinding costs on a host of parts; steel, rubber, plastics, glass, etc. Economical for rather small lots, too.

Plain Hydromatic Milling Machine. For the heavy jobs run in medium or large quantity production. Made in plain and duplex styles. 15 sizes of each.

No. 2-18 Plain Automatic Milling Machine with Hydraulic Rise and Fall Mechanism for the Spindle Carrier. Also built in No. 2-24 size.

NCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.



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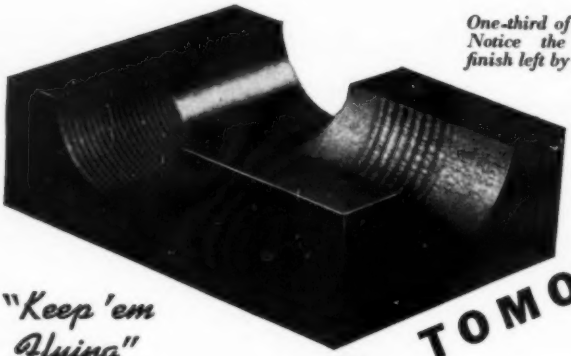

One-third of the job is completed. Notice the smooth, sparkling finish left by Kellerflex.

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Today our job is to make guns, tanks, airplanes and battleships . . . an all out for defense that finds hundreds of Kellerflex machines operating 24 hours-a-day. Grinding, burring, sanding and polishing operations that took hours of hand work in 1918, the modern Kellerflex disposes of in record time—*and it does a better job.*

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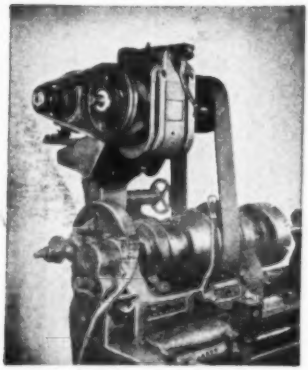
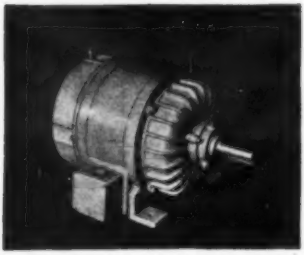


Type 4SG Torq Drive with selective four speed sliding transmission for motorizing lathes, shapers, millers, etc. Torq Drives deliver more torque capacity at the output shaft than is ordinarily obtainable.



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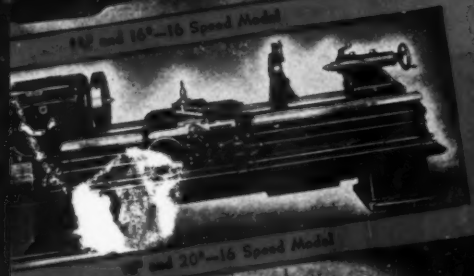

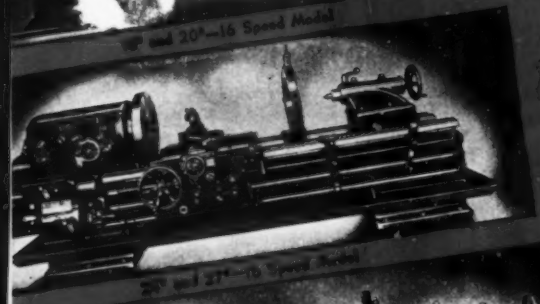

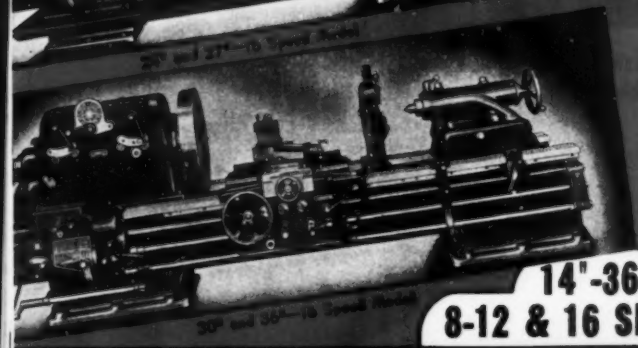

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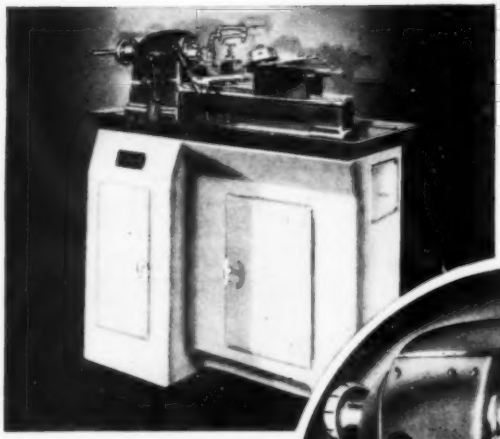
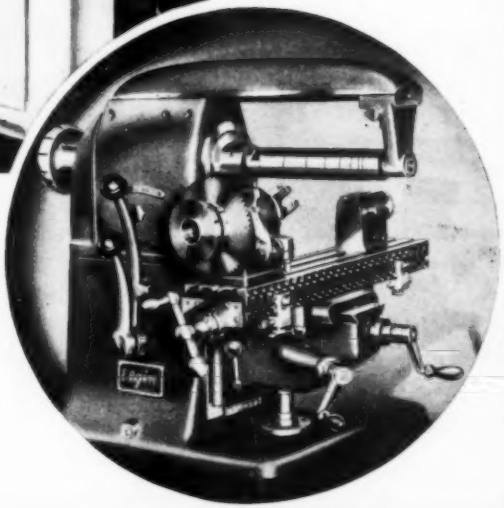


Precision Hand Screw Machine

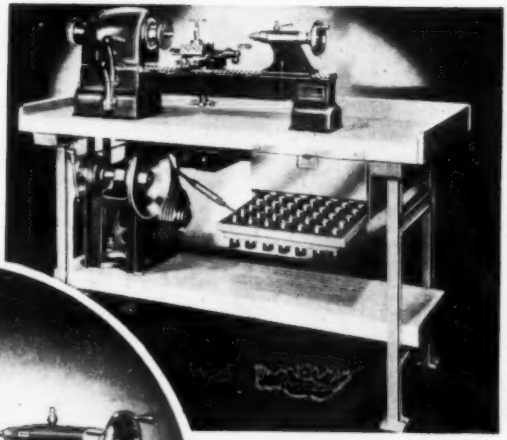


Bench Milling Machine

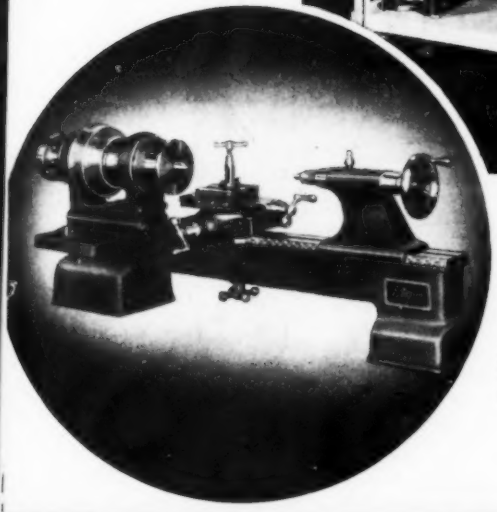
DIVISION OF THE HARDINGE MFG. CO.

ELGIN TOO

MACHINE TOOLS



Precision Bench Lathe



Cone Drive Bench Lathe

WORKS—*1772 Berteau at Ravenswood Ave., CHICAGO—ILLINOIS*

DANLY KWIK-KLAMPS

TOGGLE CLAMPS FOR QUICK, POSITIVE CLAMPING IN ANY POSITION WITH

STANDARD HALF TURN

OR STRAIGHT CLAMPING BAR

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DON'T WASTE ANOTHER MINUTE!

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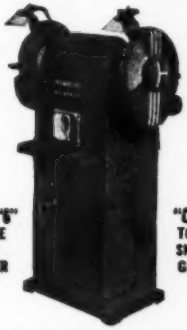
MODEL "4" CHIP BREAKER AND GRINDER

For speed in grinding chip breaker grooves in carbide tools to hairline accuracy. Bulletin GP-14.

MODEL "6" CARBIDE TOOL GRINDER

Complete range of sizes up to 14" wheels for all size carbide tools. Bulletin GP-14.



"OK" LINE TOOL AND SNAGGING GRINDERS

Maximum service, production grinders . . . "OK" models in 1, 2, and 3 HP for 10", 12", 14" wheels. Bulletin GP-12.

"DRI-N-WET" BELT SURFACERS

For Wet or Dry burring, sanding, surfacing, buffing or polishing. Handles almost any material. Models "400" and "600". Bulletin GP-7.

MULTI-HI SPEED GRINDERS

Up to 30" wheels — multi-hi-speeds combined with strength and adaptability to handle the toughest assignment. Bulletin GP-8.

Also, CYLINDRICAL POLISHERS (Tubes, Rods, other Shapes) and POLISHING MACHINERY

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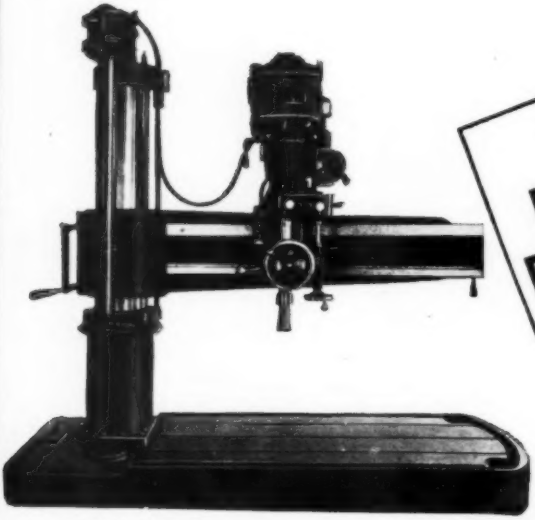

8-Speed Motor Spindle RADIAL DRILL

A new Radial Drill, that is extremely simple in design, yet has ample controls and flexibility to meet the needs of more accurate production jobs. It is powered with a spindle driven ball bearing 2 H. P. motor of the 4 speed type. Eight spindle speeds are available in all. Tapping operations are handled electrically through the instantaneous forward and reverse direction of the motor by means of a magnetic controller and a three button station having forward, reverse and stop buttons.

The column rotates on Timken tapered roller bearings and is of rigid, substantial construction.

The saddle is carried on ball bearings which travel on hardened ground steel ways. No force is exerted on the bearings when clamping saddle, as the clamp operates against the hardened gib, which comes in direct contact with the hardened way and relieves the bearings of the load. Heavily ribbed, solidly constructed base is provided with T slots.

Write for additional information.

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NEW YORK BRANCH: 407 BR

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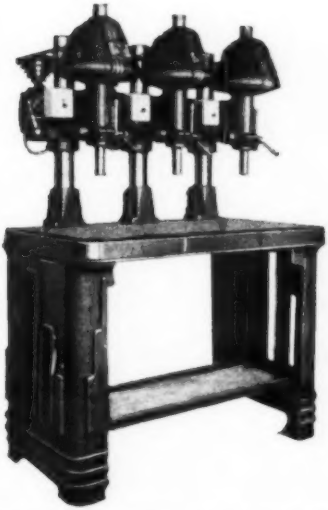

No. 18 Royal Multiple Spindle BENCH DRILL

This multiple spindle drill meets the demands of a general purpose sensitive drill, capable of production work at a minimum investment.

Equipped with 3½" tubular ground steel columns with a .200" wall, drills are mounted upon a heavy T slotted oil groove base, with accurately machined working surface; individual raise and lower mechanism on head is standard equipment.

Ball bearing construction is featured throughout. The spindles are of alloy steel, 6 splined, and are finish ground to exact size.

The standard size spindle bore is No. 2 Morse taper; The spindle is provided with a graduated adjustable depth gage for pre-determined depth drilling. The range of spindle speeds is determined by the full load speed of the motor mounted on the drilling head. An 1800 r. p. m. motor is standard; however, either 1200 or 900 r. p. m. motors are available.

For details and specifications send for bulletin No. 518-A.

ACTURING COMPANY

HICAGO HEIGHTS, ILLINOIS

ME STREET. NEW YORK CITY

A Tapping Machine
that meets your needs

. . . for highly specialized work or a wide range of jobs

The new Procunier Universal Tapping Machines are versatile enough to meet all your needs. The features that make this possible include: 1. Four Speeds ranging from 390 to 2050 R. P. M. efficiently handle jobs for which conventional high speed tapping machines are inadequate. 2. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads. 3. Extra long spiral Compensating Springs conveniently located with wide range hand screw adjustments, maintain pre-set tap feeding and reversing pressure **INDEPENDENT OF OPERATOR.**

Increased Output—More Accurate Work

The new Procunier Universal Tapping Machine is so designed that it actually allows the tap to establish its own lead. There is nothing more accurate than the tap itself in thread-cutting—so maximum tapping efficiency is attained where the tap is free to establish its own lead in cutting the thread.

This means more accurate tapping with every thread uniform, greater production with less spoiled work and less tap breakage.

Send for Bulletin

giving full details, description and prices on the full line of Procunier Universal Tapping Machines, hand, foot or air-operated, the complete line of Procunier Precision Tapping Heads to meet all needs and the new Tru-Grip Tap Holder.

PROCUNIER

SAFETY CHUCK COMPANY, 14 S. Clinton St., Chicago, Ill.

The Procunier Safety Chuck Company
14 S. Clinton St., Chicago, Ill.

Send me bulletins on: / / High Speed Tapping Heads / Tru-Grip Tap Holders / / Universal Tapping Machines.

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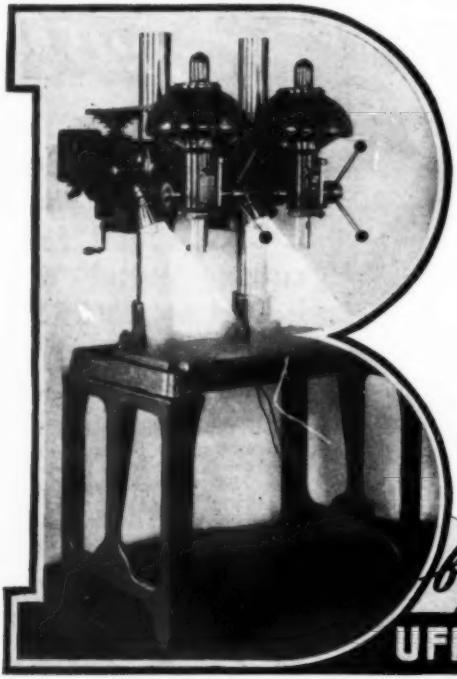
Tannewitz VARIABLE SPEED BAND SAWS

instantly adjustable to the IDEAL speed for cutting metal of EACH and EVERY Type!

In cutting off gates and risers from castings of various metals, practically any size, in cutting steel sheets up to ¼-inch thick, cast iron, plastics or any one of dozens of other cutting operations, a TANNEWITZ Variable Speed Metal Cutting Band Saw will do it quicker, better and show a handsome return on the investment involved. There are five new models in addition to our regular High Speed Band Saws, including those which handle work as wide as 52 inches, and those with 48 inch clearance beneath the guide. Get a line on the TANNEWITZ metal cutting band saw that fits your particular needs. It will save time, step up production and repay its cost dozens of times. Write for full particulars NOW!

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

Are YOUR Machines VIMCO-LIGHTED ?



This
2 Spindle Production Type
Bench Drill is Produced and
Sold with VIMCOLIGHTS
as STANDARD
EQUIPMENT

by BUFFALO FORGE COMPANY

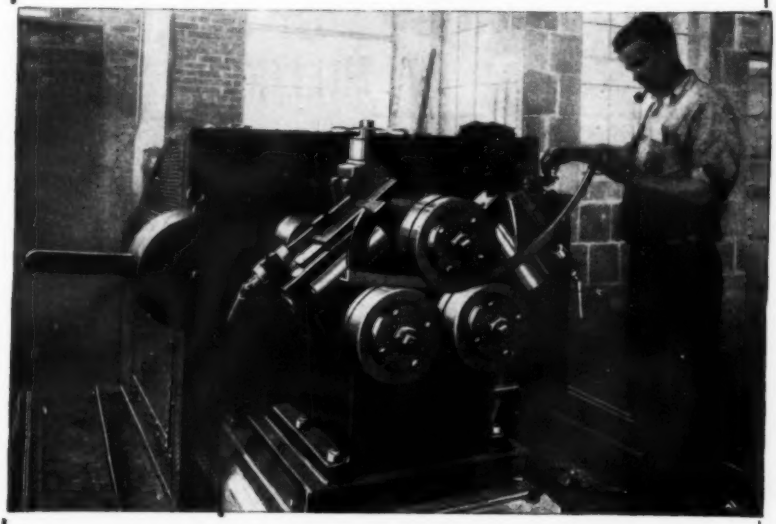
You encourage faultlessly executed, high-production machine work when operators' eyes are kept rested and unstrained because of good lighting . . . VIMCOLIGHTING ! Human eyes are your plants' most valuable and most vulnerable asset. Keep them clear and strong with non-glare, on-the-spot lighting. Conquer strain . . . save waste. Are your machines Vimcolighted ?

Vimco Manufacturing Co., 109 Chenango St., Buffalo, N. Y.

VIMCOLIGHT

VIMCO MANUFACTURING CO.

This Machine Makes Him a BENDING SPECIALIST



Accurate, Uniform Bending IN A FRACTION OF THE TIME

★ Yes, in a fraction of the time required by ordinary methods, one man and a Buffalo Bending Roll turn out accurate, uniform circular forms to meet brisk production demands. Buffalo Bending Rolls are easy to operate, even for unskilled labor. Save time and money on every bending job, simple or difficult—arcs, circles, spirals involving practically all types of stock. New Bulletin on request.

BUFFALO FORGE COMPANY

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **Bending Rolls**

ANNOUNCING—
The No. 3 Wigglesworth SMALL MILLING MACHINE

★ MOTOR IN BASE DRIVE

★ TIMKEN BEARING SPINDLE

★ POWER LONGITUDINAL FEED

★ BUILT IN ACCURACY

WRITE TODAY FOR DESCRIPTIVE LITERATURE

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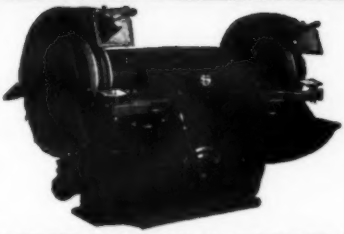
WIGGLESWORTH MACHINE TOOL CO.

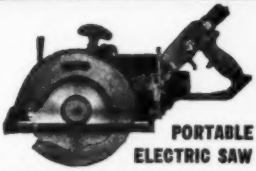
191 BENT ST. CAMBRIDGE, MASS.

1942 . . . . WHEN EVERY MACHINE MUST DO DOUBLE DUTY



4-SPEED SNAGGING GRINDER
Model 65

Gear drive transmission. For vitrified or high speed wheels. 7½ HP to 15 HP



PORTABLE ELECTRIC SAW

Ball bearing. Automatic telescoping safety guard. Adjustable foot base and bevel cutting device. 6" to 11".

PRECISION LATHE GRINDER
Model XX

For internal or external grinding. Interchangeable spindles. ¼ HP to 10 HP

United States Electrical Tools

ARE 'WAY OUT IN FRONT

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WORKING HARD

Write for Catalog No. 56

MOTOR-IN-BASE BUFFER AND POLISHER
Model 100.

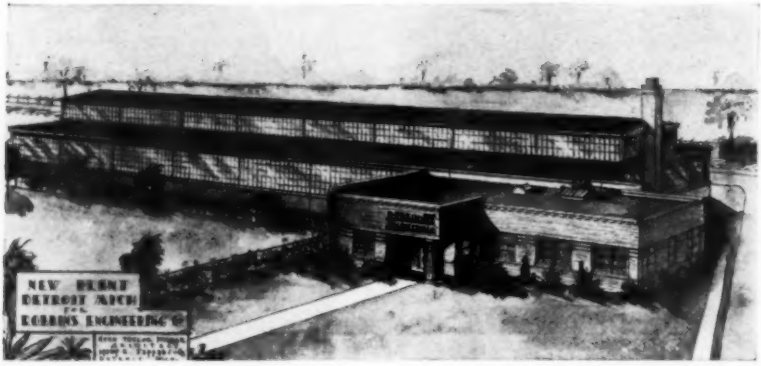
Single spindle and belt drive. 7 inch overhang for large and bulky work. 3 HP to 20 HP

THE GOOD MECHANIC'S CHOICE

THE UNITED STATES ELECTRICAL TOOL CO.

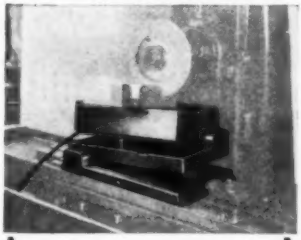
CINCINNATI, OHIO, U.S.A.

Now . . A PLANT IN WHICH WE'LL REALLY GET THINGS DONE!



THE completion of the new Robbins Engineering Company plant coincides with the increased production pace of this country's Victory Program. With facilities more than doubled . . . with additional and more efficient equipment . . . we are now in a position to give better service to all of our customers engaged in armament work and to tackle jobs which would have been impossible in our former factory.

Magna-Sines will be built in greater quantities than ever before. As a result they will be available — with little delivery delay — to every manufacturer requiring this well-known magnetic chuck for fast, accurate angular grinding work. One portion of the plant is completely equipped for the building of a wide range of special machinery. The manufacture of special tools, jigs, and fixtures — for which this company has always been noted — is also being increased. We're ready now . . . to get things done for YOU!



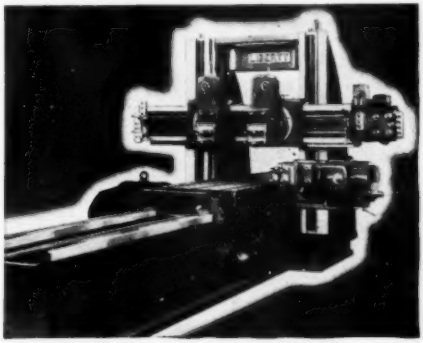
If you do an average volume of angular grinding work, the Magna-Sine will save hours of set-up time . . . will increase the productive capacity of your grinders.

Let us send you full information.

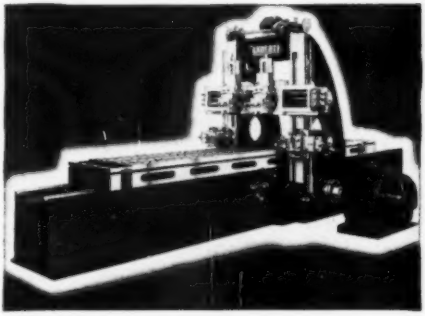
ROBBINS ENGINEERING COMPANY

318 MIDLAND AVENUE • **DETROIT, MICHIGAN**

PROMPT DELIVERY on LIBERTY PLANERS



LIBERTY 72' PLANER



LIBERTY 42' AND 48' PLANER

These planers are subject to prior sale.

Don't wait . . . place your order now so as to take advantage of earliest possible delivery. Wire or telephone for complete details.

If you are in need of planers in the following sizes we can offer exceptionally good delivery dates on LIBERTY PLANERS.

NEW LIBERTY DOUBLE HOUSING PLANERS

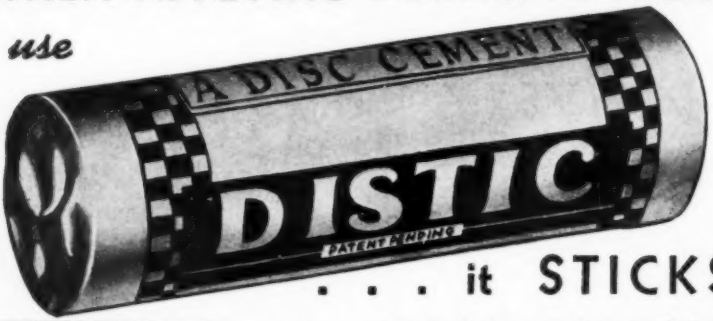
42" by 42" by 12'	March 1942
48" by 48" by 14'	Jan. 1942
48" by 48" by 16'	Jan. 1942
48" by 48" by 18'	Jan. 1942
48" by 48" by 20'	Jan. 1942
72" by 72" by 20'	Feb. 1942

LIBERTY PLANERS, INC.

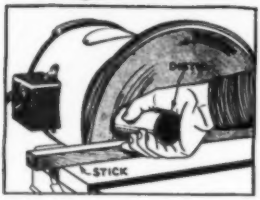
1001 WELLER AVE., HAMILTON, OHIO

WHEN APPLYING ABRASIVE DISCS

use



. . . it STICKS



it's CONVENIENT
it SAVES TIME

Distic has many advantages over the old way of gluing abrasive discs. No clamps need be used—and there is no waiting over night for the glue to harden.

With Distic, Abrasive Discs may be applied and removed so quickly that changing over from one grade of abrasive disc to another is but a matter of minutes. A dozen changes of discs may be made within as many minutes.

Because it is a stick adhesive which need not be removed from the wrapper when applied to the rotating disc, it is clean and handy to use. And it is economical too . . . a regular size stick of Distic will serve for the application of dozens of abrasive discs.

SEND FOR YOUR FREE SAMPLE TODAY

Four Simple Steps

1. Remove old garnet or emery paper and clean the steel disc.
2. Cut away a half inch of the card-board tube from the end of the Distic Stick so that a free application may be obtained.
3. Rotate the disc, holding Distic against it until it is covered with a fine gummed surface.
4. Place garnet or emery paper on the steel disc and press on with fingers. Disc is now ready for use.

When paper disc is worn out, simply tear off the old disc, apply a new coat of Distic and replace with a new garnet or emery paper disc.

DELTA MILWAUKEE

— MFD. FOR —

THE DELTA MANUFACTURING CO.

600-634 E. Vienna Ave. Milwaukee, Wis.

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DISTIC MFG. CO. Box 763, Albany, N.Y.

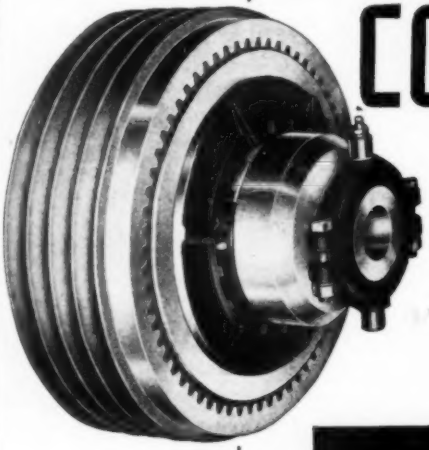
RACINE UTILITY SAWS

The all purpose "Utility" saw you need for your general shop cutting —for maintenance work—for auxiliary sawing in your cut off departments. It gives you fast, accurate cutting with sensitive hydraulic control for cutting off the full run of materials from tool steel to thinnest walled tubing. It has two speeds—6" x 6" capacity—swivel vise for cutting angles and is made in wet or dry cutting types. It is a soundly engineered "Utility" machine designed for general all purpose work.

Write for information on these saws or on any one of the many RACINE models from "Utility" types in 6" x 6" capacity to production types in 6" x 6", 10" x 10" up to 14" x 20" capacity—also fully automatic bar feed machines—we will be glad to give you production estimates without obligation.

"RACINE
STANDARD THE WORLD OVER"

RACINE TOOL AND MACHINE COMPANY
1754 STATE ST., RACINE, WISCONSIN



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Sheave Clutch PULLEY

More Power

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Instant Release

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Easy Engagement

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Drag-free Idling

WHAT IT DOES

THE CONWAY CLUTCH

Modern methods call for "first-aids" to greater production and lower costs. Simplified, improved, strengthened, Conway Clutches answer every demand for rugged, constant service.

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The CONWAY CLUTCH Company

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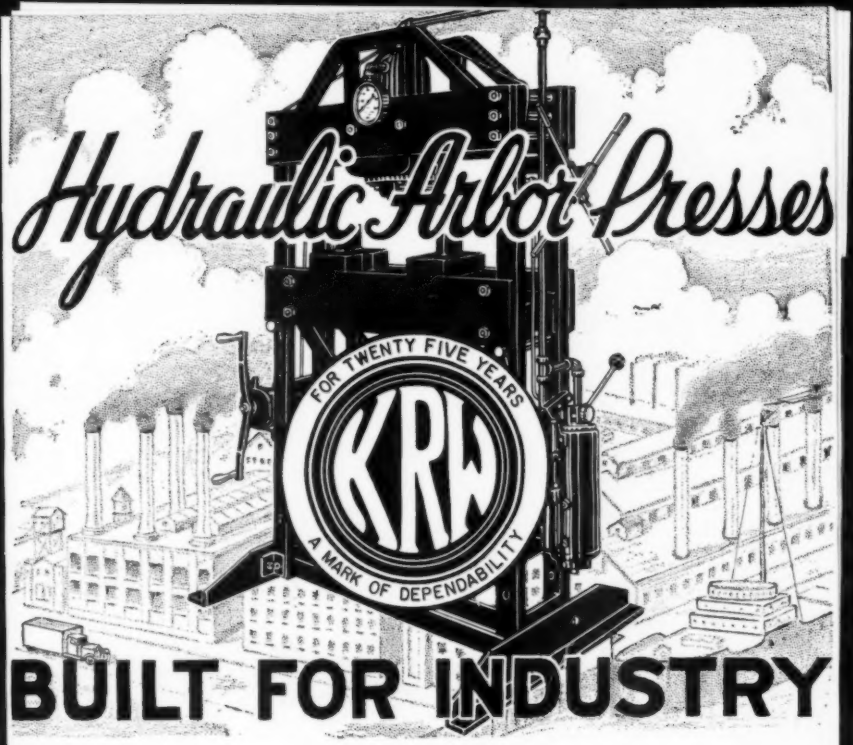

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RW Hydraulic Arbor Presses meet industry's demand for PEED. Speed in getting the ram to the work—Speed in eveloping required tonnage pressure—Speed in raising the m to remove the work.

end for your copy of the new 16-page bulletin describing detail the NEW 2 Speed Pump—the Lever Controlled alve that opens or closes with a flip of the Ball Arm—and any other patented features found only on KRW Presses.

uilt in 25, 50 and 75 ton sizes. Prices start as low as 198.00.* Compare before you buy.

** Prices F. O. B. Arcade, N. Y. Slightly higher west of Rockies.*

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K.R. Wilson, 27 Lock St., Buffalo, N.Y.
Please send Hydraulic Arbor Press Bulletin No. 27.

Name .....
Address .....
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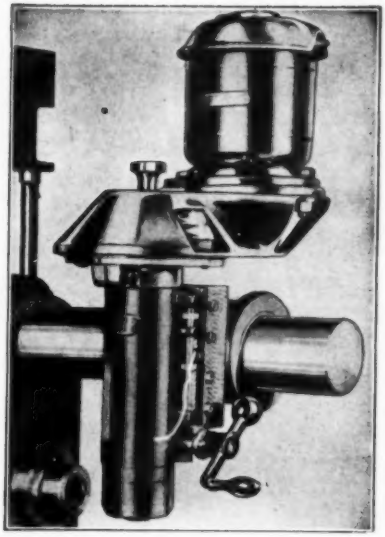
HALCO
Universal Head

Speed-Accuracy-Dependability



The Halco Hi-Speed Universal Milling attachment is designed to meet the demand for greater efficiency, better workmanship, and for speed in building tools, dies, jigs, fixtures, wood and metal patterns, and other machine products where accurate and fast machining are of prime importance.

With its 4 inch vertical travel, many drilling, milling, boring and facing operations can be accomplished in one setup. The total weight is approximately 90 pounds, and it can be easily mounted by one man.

The Halco Head is engineered and built to precision limits in a modern shop by skilled mechanics. All parts and materials built into this machine are the very best obtainable and unconditionally guaranteed for six months.

Motor of heavy duty type, 1/3 H. P., 110 volts, 60 cycle, with plug-in cord and switch. Easily reversible for L. H. cutters. Five speeds 350 to 2900 R. P. M. Also 10 speeds 125 to 2900 R. P. M. available at extra cost.

PRICE $225.00 In U. S. A.

With 10 Speed Back Gear $55.00 Extra

Sold direct, factory to you, or your nearest dealer. Many machines in use. Tried and tested in machine plants for 1-1/2 years. Each head is unconditionally guaranteed for six months.

Write for folder giving details or order now for quick delivery.

HALCO PRODUCTS CO.

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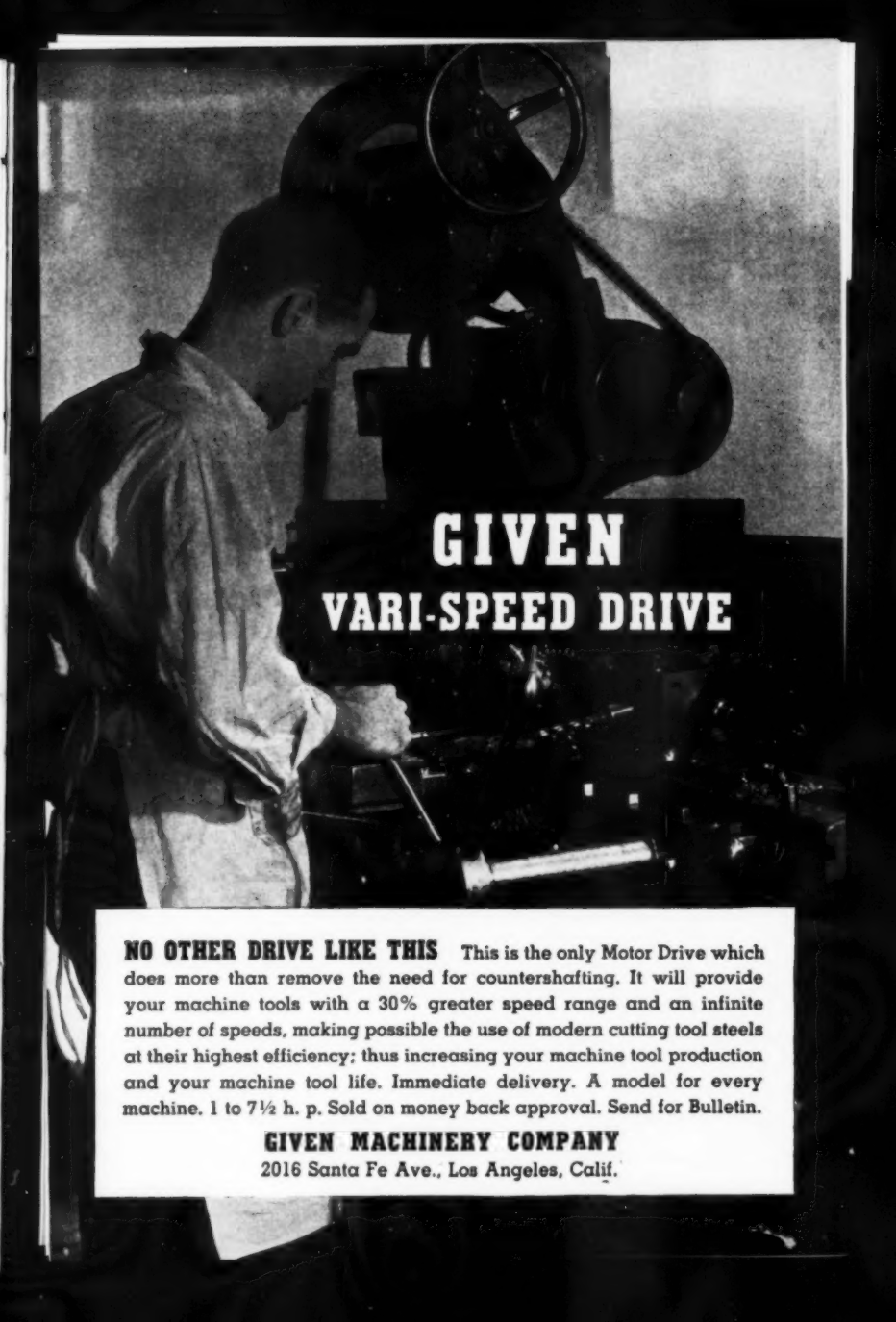

NO OTHER DRIVE LIKE THIS This is the only Motor Drive which does more than remove the need for countershafting. It will provide your machine tools with a 30% greater speed range and an infinite number of speeds, making possible the use of modern cutting tool steels at their highest efficiency; thus increasing your machine tool production and your machine tool life. Immediate delivery. A model for every machine. 1 to 7½ h. p. Sold on money back approval. Send for Bulletin.

GIVEN MACHINERY COMPANY

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COURTESY OF THE LOCKHEED AIRCRAFT CORP.

PRODUCTION TOOLS
THE WYCO HY SPEED SAW — HOLE AND WASHER CUTTER

For the needs of Defense, we originated and produced these two important additions to the WYCO Line. The demand for them is heavy, and our production effort is being stepped-up. Now, we are at war and the need will be even greater. Therefore, we pledge an all-out effort to look after priority demand. After these requirements are satisfied, we shall fill orders in rotation of their receipt.

Our bulletins and catalog on these and the complete WYCO Line of Flexible Shafts and Flexible Shaft Grinders and Buffers will be sent on request.

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838-844 W. HUBBARD ST., CHICAGO, ILLINOIS
Brooklyn Office: 1288 Bedford Ave., Toronto Office: Rep. A. Ross Osborne, Capitol Bldg.

SET 2, 3 OR 4 RIVETS AT ONCE AND WATCH YOUR PRODUCTION JUMP!

YES... you can double and treble your production rate and lower production costs at the same time, with Chicago Multiple Rivet Setters. Versatile, automatic Chicago Riveters are made for a wide variety of uses in both light and heavy duty types.

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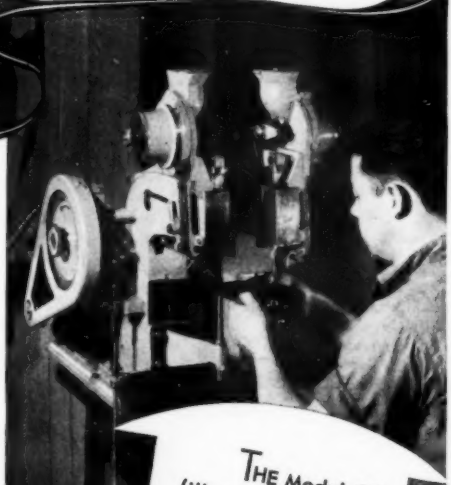
Write for Special Automatic Rivet Setter Bulletin or submit blue print or sample assembly for recommendations.



THE Model 55 (illustrated) which automatically feeds, inserts, and clinches two rivets at each stroke of the machine, has adjustable centers which are easily and quickly set.

Chicago RIVET & MACHINE CO.

9610 West Jackson Blvd., Bellwood, Illinois (Chicago Suburb)

Tubular and Split Rivets in All Rivet Metals

Automatic and Manual Rivet Setters for One to Four Rivets at a Stroke

Is Your TAPPING Production up to these figures ?

2400 to 12,000
TAPPED HOLES PER HOUR

That's the production range you can readily maintain on the

Ettco-Emrick
FOOT-OPERATED
TAPPING MACHINE

2400 with the standard 2-spindle tapping head as illustrated — and all the way up to 12,000 with the Ettco-Emrick Multiple Heads which are available with spindles up to 12.

UNSKILLED LABOR CAN DO IT!

Unskilled labor can maintain this high production on the Ettco-Emrick Tapping Machine because **Ettco-Emrick design eliminates the human element from the actual tapping operation.** All the operator does is feed the work for which both hands are free because the machine is foot-operated.

GET THE FACTS — Full details about the Machine are given in Bulletin No. 4 — and about the Multiple Heads, in Bulletin No. 3. Write for copies today.

IMPORTANT

The right taps and the right work holding set-up are essential for high tapping production. Our recommendations, based on 25 years specialization on machine tapping, are yours without obligation.

ETTCO TOOL CO.

596 Johnson Avenue, Brooklyn, N. Y.
DETROIT CHICAGO

The Famous Ettco-Emrick

DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

COMPARING CONVENTIONAL GRIND WITH CIRCULAR RELIEF GRIND

MORE PIECES PER GRIND

WITH

CIRCULAR RELIEF GRINDING

For grinding reamers, taps, cutters and all tools that require clearance along their periphery. The Original Circular Relief Grinder has been perfected to such a high degree of precision that it effects economies unapproached by the older methods of relief grinding—And this grinder generates the nearest approach yet obtained to the ideal cutting edge for all tools within its range.

You Get . . .

- More grinds during life of tool
- Closer tolerance
- Exact duplication of grind
- Simplicity of operation
- Smaller investment in tools
- Greater profit

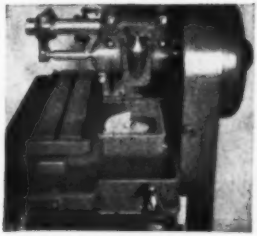
Write for complete information

ONE MACHINE • ONE SET-UP • ONE OPERATION

THE CLEVELAND TOOL ENGINEERING CO.

9200 DETROIT AVE. • CLEVELAND, OHIO

PRECISION—*even*



U. S. Multi-Millers feature standard cams to provide cycles of fast table approach, cuts at desired speeds, and fast return — all smooth actioned. Special cams for any cycle of special table action. No back lash, ever!

—and for taking cuts on the return stroke of the table, this Double Cam provides absolute control for a desired return feed.

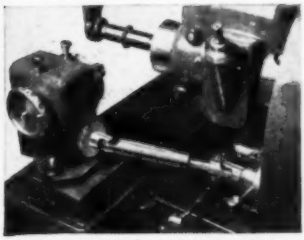
For milling intricate contours. Actual operations photo illustrates advantages possible with this special Hinged Fixture to facilitate fast milling of intricate contours.

with unskilled labor!

PRODUCTION executives, engrossed in Defense production, find in the U.S. Multi-Miller an unusual, fast, precision machine tool—as evidenced by this recent installation photograph at the left which shows a battery of U.S. Multi-Millers producing munitions parts in a large mid-western plant. The automatic and precision features of these machines—some of which are illustrated below—provide the means for speedy and accurate *climb milling, rotary milling, index milling, high speed grinding, vertical milling, contour milling, spur gear cutting, hand milling, automatic cut-off, continuous milling of bar and coil stock.* Short-lot jobs are regularly produced as profitably as long-run jobs; substantial savings can be realized, in that one operator can easily handle a large battery of U.S. Multi-Millers; inexperienced operators in many Defense plants reliably complete important and intricate work.

THE U. S. *Multi* MILLER

U. S. TOOL COMPANY, INC., AMPERE (East Orange), N. J.

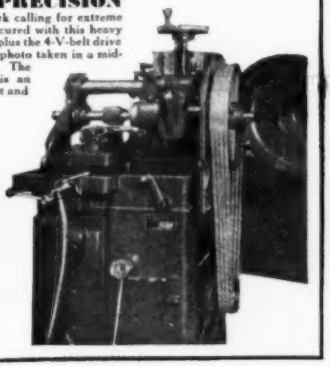


New Horizontal Type Indexing Fixture permits a single operator to handle a battery of these machines. Indexing is fully automatic; drive to fixture is direct from cam shaft.

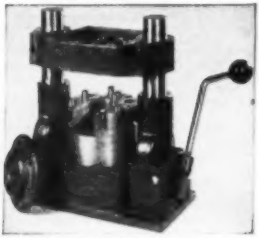
Rigidity for PRECISION

Heavy duty cuts on work calling for extreme accuracy are easily procured with this heavy duty Overarm Support, plus the 4-V-belt drive illustrated in this action photo taken in a mid-western Defense plant. The result of this set-up is an exceptionally smooth cut and an excellent finish.

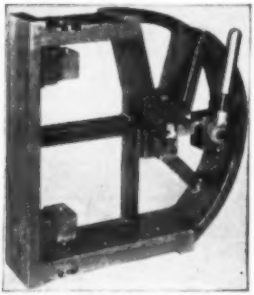
This newly revised Bulletin, just published, interestingly illustrates all U. S. Multi-Miller features and advantages. Those listed on these pages are described in full detail, and many more. Your copy will be sent upon request, with no obligation whatsoever.



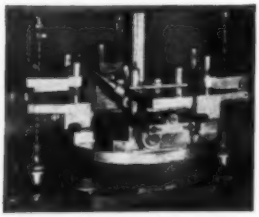
WE CAN DESIGN AND BUILD YOUR DEFENSE TOOLS . . . .



An Esco E-22 Drill Jig for multiple-drilling six holes in tractor hub.



Esco Jack Lock applied to a specially designed tumble jig for Y-shaped casting.



Close-up of fixture layout on fully automatic drilling machine designed and built by Esco Engineering Corp.

JIGS . . FIXTURES SPECIAL MACHINERY

Our designers and tool makers are thoroughly experienced in the building of tools, jigs, fixtures and special machinery . . . for defense items. Individual items or complete programs.

Write or wire for a representative or for further information.

•

Manufacturers of

ESCO DRILL JIGS
"MIJIT" DRILL JIGS

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ESCO
ENGINEERING CORP.

4855 FOURTH AVENUE

DETROIT • MICHIGAN

CERRO ALLOYS for Prompt Shipment

CERROMATRIX (Melting Temp., 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, for engraving machine models, stripper plates, chucks, short run forming dies and other metal-working applications.

CERROBASE (Melting Temp., 255° F.) For reproducing master patterns, models for electroforming, engraving machine models, proof casting for forging dies, etc. Perfect reproduction of intricate detail.

CERROBEND (Melting Temp., 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

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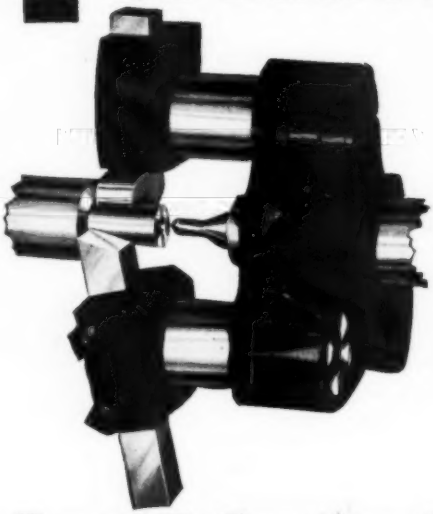
40 WALL STREET - - NEW YORK, N. Y.

TURNING and CENTERING IN 1 OPERATION



with R and L Turning Tools

This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

R and L TOOLS

1827 Bristol St. Nicetown, Philadelphia, Pa.

LESS MOTION — MORE PRODUCTION

The New Kirk & Blum Turn Table is a convenient and practical piece of equipment for the machine tool industry. Uses the hooded type, cross draft with connections taken from the rear of hood into exhauster.

This table is ideal for use in grinding and finishing small castings. No longer need the operator be a pedestrian. He can remain in one position to work on all sides of castings.

A spring type pedal releases the turn table and operator merely turns the table to the desired position of casting, for further grinding and finishing. Speeds production and reduces costs.

Another example of the versatility of Kirk & Blum Engineering Service. Write today for further information.

THE KIRK & BLUM MFG. COMPANY

2804 Spring Grove Ave., Cincinnati, Ohio

SOME USERS OF

TURNER UNI-DRIVE

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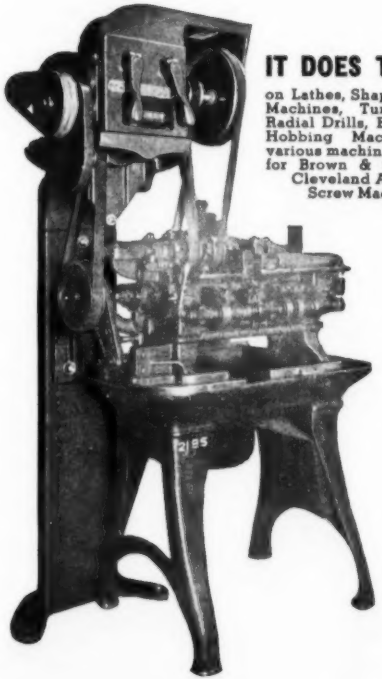
Your Production Capacity 25% to 300%



IT DOES THE JOB

on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines, and various machine tools. Also for Brown & Sharpe and Cleveland Automatic Screw Machines.

Here's *proved, dependable* aid in stepping up and keeping your production at full speed ... the TURNER UNI-DRIVE. In many of America's largest plants this *successful* motor drive is speeding production, saving labor and time, cutting power costs. So sure are we that it will prove a big aid in your business that we guarantee Uni-Drives for one year—subject to return for full credit within 60 days if not satisfactory.

UNI - DRIVE eliminates overhead counter shafts. No belts to shift. Increased efficiency of machine and operator. Installed in 2 to 4 hours. All the advantages of geared head with belt drive smoothness. Big saving in power. Sizes ¼ to 20 H. P.

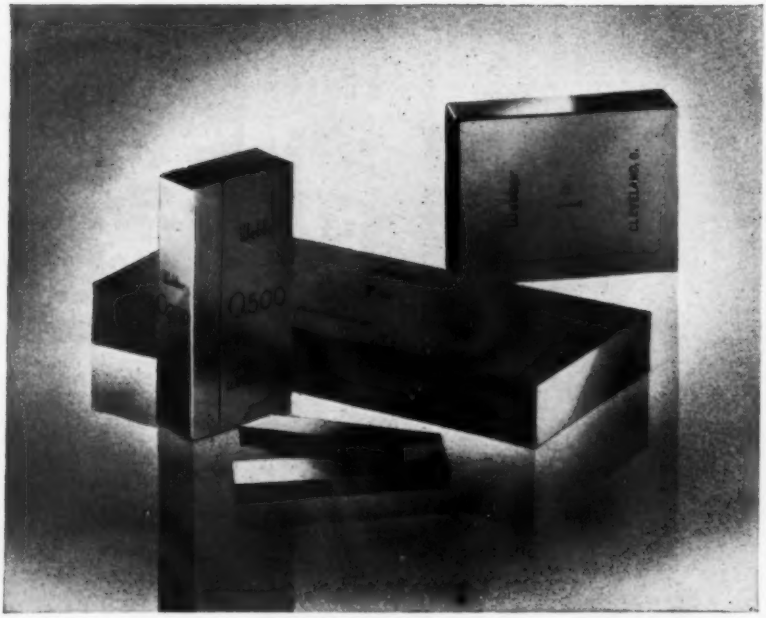
Investigate . . . and be convinced! See your dealer at once, or write to us for full information and prices.

(DEALERS: Write for full details about this fast-moving line for your territory.)

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
1638 Central St. **Kansas City, Mo.**

TURNER
UNI-DRIVE
Motorizes Machine Tools

The Basic Elements
of
Interchangeable Manufacture



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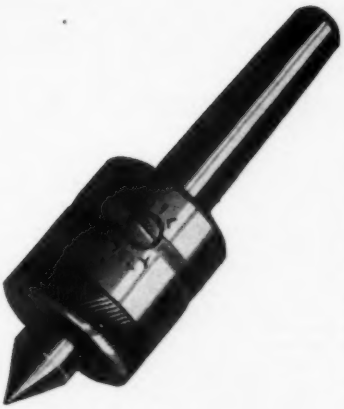

"PRECISION"

CENTER of CENTERS

The "Precision" The center of centers are made for the smallest tool room lathes as well as the largest railroad shops. Severe conditions are no hazard to the accuracy and long life of the large taper thrust and annular roller bearings. Precision mounted, front bearing cone seats on resilient pad—a shock absorber protection against tool breakage. Available in taper shank, slip in, slip over and spindle types. For unconditional proof, test in your own plant.

Utility Tools

- ☐ REAMERS
- ☐ CORE DRILLS
- ☐ SPOT FACERS
- ☐ LIVE CENTERS
- ☐ COUNTERBORES
- ☐ COUNTERSINKS
- ☐ FLOATING HOLDERS

THE UTILITY SLEEVE

will cut tool costs. A saving of at least 40% (some users report 75%) with this removable taper shank tool driver. It is used with taps, drills, countersinks, reamers, end mills, center drills, counterbores, woodruff cutters, etc. The sleeve is a two jaw collet in action, fitting over the diameter of the shank of tool, which is positively driven by flats or the tang on shank end.

SPECIAL BULLETIN GIVES FULL INFORMATION ON UTILITY TOOLS. CHECK THE ONES OF INTEREST AND MAIL TODAY

THE J. C. GLENZER CO., INC.

6465 EPWORTH BLVD., DETROIT, MICH.

Defense Savings Pay-Roll Allotment Plan

How company heads can help their country, their employees, and themselves

voluntary pay-roll allotment plan

helps workers provide for the future;

helps store up tomorrow's buying power;

helps defend America today.

Business heads are adopting the Voluntary Pay-Roll Allotment Plan as a simple way for every worker to start a *systematic* and *continuous* Defense Bond savings program. It is a sensible step toward reducing the ranks of the post-war needy. It will help spread the financial participation in national defense among all of America's wage-earners. It will materially retard inflation by "storing" part of our pyramiding national income, thus reducing the demand for our diminishing supply of consumer goods.

In emergencies, America doesn't do things "hit-or-miss." **We would get there *eventually* if we just left it to everybody's whim to buy Defense Bonds when they thought of it. But we're a nation of businessmen who understand that the way to get a thing done is to *systematize* the operation. That is why so many employers are getting back of this voluntary savings plan.**

DSD—BP 1A

All you have to do is offer your employees the convenience of having a fixed sum allotted from each pay envelope to the purchase of Defense Bonds. Each employee who chooses to start this savings plan decides the denomination of the bonds to be purchased, and the amount to be allocated from his wages each pay day. You deliver a bond to the employee each time his allotments accumulate to a sufficient amount.

Plenty of help available. **The Treasury Department is ready and willing to give you all kinds of help. Local civilian committees in 48 States are set up to work with you just as much as you want them to, and no more. We will supply most of the necessary material.**

The first step is to take a closer look. **Writing for details in no way obligates you to install the plan. It simply indicates that you'd like to do *something* to help keep your people off relief when defense production sloughs off; *something* to enable *all* wage-earners to participate in financing national defense; *something* to retard inflation and store up tomorrow's buying power. So, write for the free kit of material being used by companies that have installed the Voluntary Defense Savings Pay-Roll Allotment Plan. Address: Treasury Department, Section A, 709 Twelfth Street NW., Washington, D. C.**

No. 16 TOGGLE PUNCH PRESS

The No. 16 TOGGLE with large die space is suitable for punching and shearing tie plates, punching and straightening splice bars, also for general manufacturing press, punching and shearing articles. Drive is mounted inside of frame.

The Press is equipped with magnetic or air clutch. This is a high speed heavy duty Press for many applications.

GENERAL DIMENSIONS:

	No. 16	No. 16A	No. 16B
Face of slide, right to left	43"	53"	62"
Face of slide, front to back	24"	26"	26"
Die space, slide down	20"	20"	20"
Stroke; Standard	3"	3"	3"
Maximum	5"	5"	5"
Face of table, right to left	53"	60"	66"
Face of table, front to back	24"	26"	26"
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½"	15½"	15½"
Weight	76,000	82,000	88,000 lb.
Motor required Horse Power	20	30	40

BEATTY MACHINE & MANUFACTURING CO.

HAMMOND, INDIANA

ALSO BUILDERS OF

Punches: Single and Double—"C" Frame
Horizontal Punches
Multiple Punches
Gate Shears
Bar Shears
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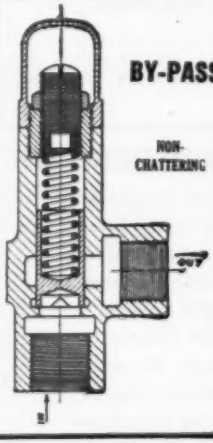
Splitting Shears
Coping Machines
The CoPun Shear (Cope Punch Shear)
Vertical Bulldozers
Spacing Tables
Hydraulic Press Brake and Flanger.
Hydraulic Presses.

Resolve for 1942

"We will install only the most dependable equipment . . . the kind that will make production better, quicker and more economical".

FULFLO

HELPS YOU SAVE TIME and MONEY



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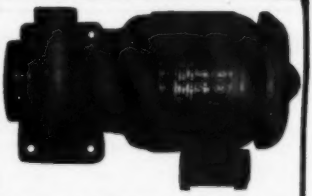
For oil pumping units where specific pressure must be maintained. Cast iron or brass. Brass, hardened or stainless steel pistons.



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Choose from the widest line in America . . . a coolant pump for every purpose. Precisely engineered and machined to insure exact position of discharge.

Get newest bulletins for 1942 . . . now ready

THE FULFLO Specialties Co., Inc.
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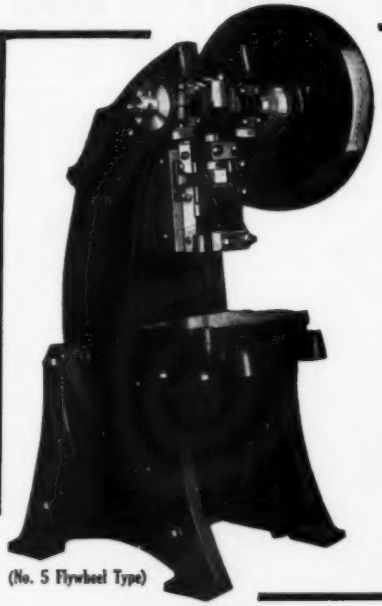

(No. 5 Flywheel Type)

The *Most*

FOR YOUR MONEY

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BETTER PRODUCTION

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LONGER LIFE

MARSHALLTOWN PRESSES

★ *Write today for literature about Marshalltown Presses — available in capacities from 5 to 70 tons.*

When you buy a Marshalltown Press, you get a press that is designed and built for extreme dependability, and a press that is an outstanding value. Features of design include more die space, chrome nickel cranks, wrist pin connections and many other proven advantages.

MARSHALLTOWN MFG. CO.

900 E. Nevada St., Marshalltown, Iowa

AMMCO 7" SHAPER

"A precision machine of a thousand uses"

- - IT'S PORTABLE - -

Saves Steps and Time

Don't tie up a big shaper when so many jobs can be done just as accurately and much quicker on AMMCO 6" PRECISION SHAPER . . . Available for stationary installation or mounted on portable cabinet easily rolled to the mechanic's workbench.

Features of this Shaper include quick adjustment of stroke, ram position, tool head, table height, table support, feed and speed . . . The maximum length of stroke is 7¼" . . . Table has five cross feeds (reversible) . . . Countershaft has three-step cone pulley . . . ¼ or ⅓ H.P. Motor.

Manufactured by an organization having years of experience in producing precision machinery . . . Recommended by leading machine tool dealers and machine tool manufacturers.

Write for Specifications and Prices.

AUTOMOTIVE MAINTENANCE MACHINERY CO.

2106 Commonwealth Avenue, North Chicago, Ill.

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FURNACES

Ready for Delivery

- **Save Up to 2½ Hours Production Time**
- **Reach Maximum Temperatures in Less than 30 Minutes**
- **Save Up to 50% on Gas Consumption over Ordinary Units**
- **Compact, Space Saving Construction**

These are the furnaces which are revolutionizing production time and costs! A complete line of Johnson Furnaces NOW available for every industrial purpose

No. 120 High Speed Steel Heat-Treating Furnace, reaches 2300° F. in 30 minutes. $149.50 F.O.B. Factory *

No. 550 Pot-Hardening and Melting Furnace, available in many pot sizes. $125 F.O.B. Factory *

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Johnson Gas Appliance Co., 554 E. Ave., N. W., Cedar Rapids, Iowa

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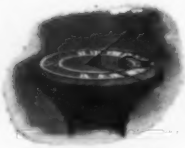

SAVE TIME
WITH SOUTH BEND LATHES

SPEED
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ACCURACY
•
EASE OF OPERATION
•
VERSATILITY

13" x 5' South Bend Underneath Motor Driven Toolroom Lathe

South Bend Lathes are made in five sizes: 9", 10", 13", 14½", and 16" swing. All sizes are supplied with toolroom or manufacturing equipment. Write for catalog and the name of our nearest dealer.

TIME IS PRECIOUS these days. The success of our national defense plan depends on maintaining heavy production schedules—there is no time to lose.

When you need increased production, when your toolroom is rushed beyond its capacity, you can save time with South Bend Lathes. Their wide range of spindle speeds permits machining work with maximum cutting tool efficiency—their unquestionable accuracy assures uniform precision—their ease of operation reduces fatigue and prevents mistakes—their versatility facilitates quick change-over from one job to another.

SOUTH BEND LATHE WORKS

766 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

LATHE BUILDERS FOR 35 YEARS

Editor's Page

IF the dictators were as good at mass psychology as at armament building, they would be even more dangerous.

The Nazis tried to terrorize the British by civilian bombing. What they did was to unite the Britishers and make them fighting mad.

The Russian sortie has fallen far short of advance notices largely because Berlin underestimated the Slav spirit.

I don't know just what the dastardly attack on our far Eastern forces was supposed to do—but it has given us complete national unity plus a high tension fighting spirit.

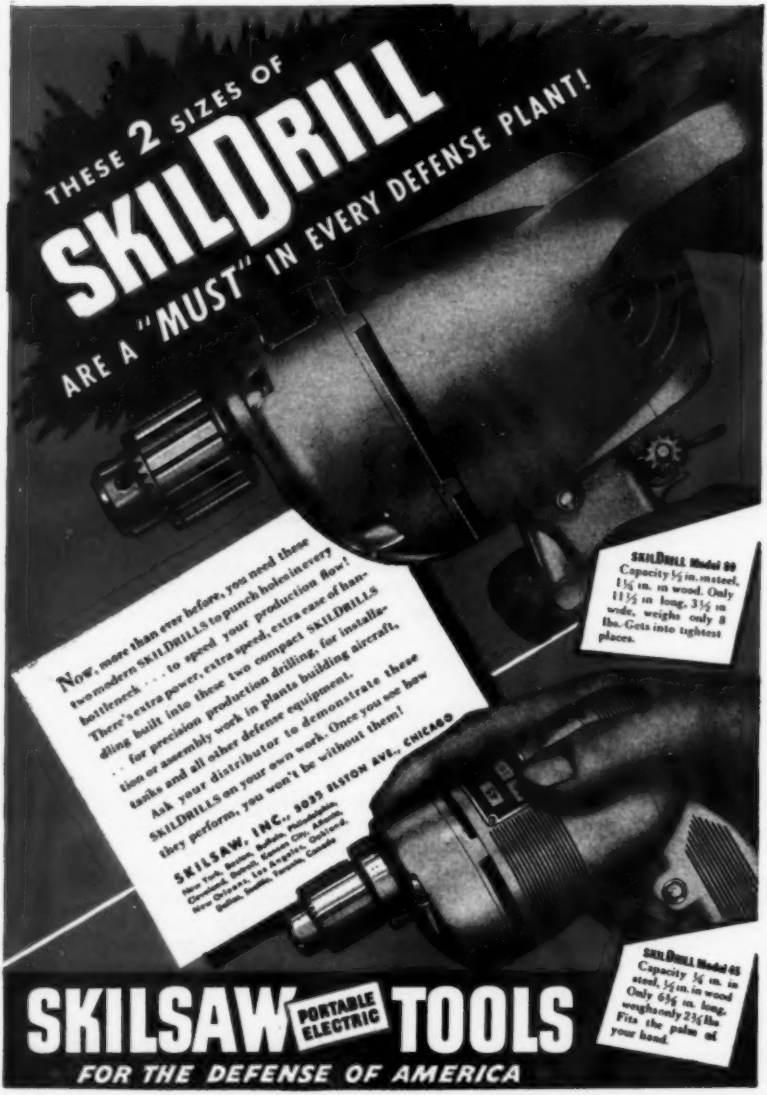
Enlistments have risen to a new peak. Workers in the shops are going about their tasks, grimly determined that production shall be in time and in sufficient volume.

Our loyal defense industries are far ahead of where we might expect them to be, in view of past political and labor dissension. The future will be quite another story. We have had more than a year of grace and our production lines are that much to the good.

We must not underestimate our cruel and unprincipled adversaries. We are facing a gruelling test that will try all our resources. We must expect disappointments and adversity—but as a united nation, we face the peril with faith, confident of the ultimate outcome.

Our defense program is transformed into a victory program in which we must do our utmost. Fighters in the front lines must depend—and can depend on the defense workers in our shops. Defense production is the key to final victory. We can dissipate the dark clouds by showing the world a new conception of American all-out mass production for the defense of all that we hold dear.

Wesley G. Paulson


THESE 2 SIZES OF
SKILDRILL
ARE A "MUST" IN EVERY DEFENSE PLANT!
Now, more than ever before, you need these two modern SKILDRILLS to punch holes in every bottleneck . . . to speed your production flow! There's extra power, extra speed, extra ease of handling built into these two compact SKILDRILLS . . . for precision production drilling, for installation or assembly work in plants building aircraft, tanks and all other defense equipment.
Ask your distributor to demonstrate these SKILDRILLS on your own work. Once you see how they perform, you won't be without them!
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Featured In This Issue

THREAD GRINDING is by A. Rosseau, Specialist in that line of work for The Norton Company, Worcester, Mass. He analyzes abrasive wheel requirements for a broad range of thread grinding jobs—tells about many of the difficulties encountered in thread grinding and explains why. Little has been published on the subject and we believe Mr. Rosseau's observations are timely and helpful, in the story commencing on page .....61.

INDUSTRY IS GOING "GREAT GUNS" by Paul McCrea, is inspirational and reassuring. Written and published in the last issue of Nation's Business, before the outbreak of hostilities in the far East, it reveals how many of our industries have tackled defense problems in typical American way. While defense production still is far from the goal, now that we have national unity and the defense industries have the green light, the world soon will see some amazing production strides in our Victory Program. Read Mr. McCrea's story and think how much better we are off than if the blow had fallen one or two years ago. See page .....89.

FLAME HARDENING AND CUTTING are two speedy and economical processes that are much used in defense production. Francis A. Westbrook, M. E., tells about some of the things that have been done in these two essential lines, in a story beginning on page .....127.

DEFENSE SAVINGS Pay-roll Allotment Plan describes the new method of helping employees save for the future and at the same time aid the Government's defense effort .....143.

WIRE RETAINERS and Snap Rings is by H. F. Williams, a frequent contributor to these columns. Mr. Williams illustrates and describes a number of specific applications and hopes that these may help to solve some designers' problems. See page .....147.

FINISHING PLAIN BEARINGS with Diamond Tools is by Paul Grodzinski, a Consulting Engineer in Britain. He reviews European practice, gives some specific hints on the use of diamond tools and tells what may be accomplished and how, in the story beginning on page .....161.

INDUCTION HARDENING Eliminates Rocker Arm Bushings. Page 175.

PLANT LAYOUT Steps-up Defense Lighting Production is by C. H. Smith, Supervisor of Time Study, and R. W. Mallick, Plant Layout Engineer, Westinghouse Electric & Mfg. Co. Realizing the importance of lighting in defense industries and military requirements, Westinghouse has revamped and streamlined its Lighting Division at Cleveland, Ohio and is now ready to step-up production of lighting equipment. The new facilities are described in detail, and many of the features are illustrated in the story commencing on page .....181.

NASMYTH DRAWINGS—These interesting drawings of three pioneer English machine tools are now in America. Three of them are reproduced on pages .....196-8.

LET'S TALK SHOP" presents a collection of useful shop hints:—the Westinghouse incentive method of computing pipe fitting costs, with charts, etc., Carbide tool suggestions, a dust collector kink, chaser care and threading suggestions, etc. This section commences on page .....201.

WHAT'S NEW in the Industry, presents many new machine tools and production equipment items in the section beginning on page .....219.

MECHANICS THROUGH THE AGES—Blue Book's regular feature picture page .....270.

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Thread Grinding

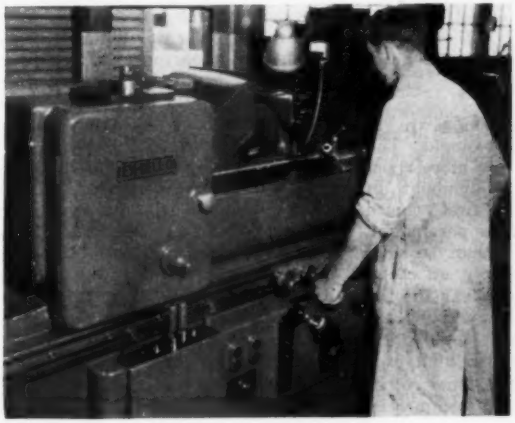
By A. ROSSEAU

DURING the past two years and especially in recent months, thread grinding has increased tremendously throughout the country. Makers of airplane motors, for example, are turning to ground threads on countless parts to obtain the desired combination of accuracy and finish. This large increase in thread grinding has naturally stirred interest in the subject and brought a demand for practical information. Therefore we will try to cover here the most essential principles of thread grinding from the abrasive viewpoint, and tell how to overcome some of the difficulties most commonly encountered.

Abrasive

In thread grinding, the kind of material does not exert so much influence on wheel selection as in other classes of grinding. One of the reasons for this is that oil is always used as a coolant. This serves as such an effective lubricant that loading of the wheel is reduced to a minimum and in many cases does not occur at all. This is true even when grinding such materials as aluminum and brass, which usually cause loading on other classes of grinding where water compounds are used.

Therefore, on most thread grinding



Grinding the thread on the end of a machine spindle.

Threads of feed screws may be ground with speed and precision.

jobs a fused alumina abrasive is employed—either the special white type or the regular type. Often a single wheel specification can be used for grinding several different materials.

If a considerable amount of grinding is to be done on cast iron alone, however, it would be advantageous to procure a silicon carbide wheel. Silicon carbide vitrified wheels are also recommended for grinding worms in brass and bronze.

Bond

Two types of wheel bonds are in general use, vitrified and resinoid. The vitrified bonded wheels are more rigid, hence maintain better alignment in service and should be first choice where accuracy of lead is paramount. They cost a little more than resinoid wheels, but this is probably offset by the fact that they do not wear the diamonds so fast as do resinoid wheels.

Resinoid bonded wheels hold their edges better, particularly on high production of studs, screws, and other parts which are made to commercial tolerances. They will resist more abuse and produce a brighter finish, but being more flexible, they are more likely to follow a lead error in a pre-cut thread and may even generate a lead error, especially toward the end of the cut where the wheel is not fully supported on both sides.

Grit Size

Grit size is of great importance. A common practice has been to allow the pitch of the screw to be the deciding factor in selecting the grit size and many tables of wheel recommendations are based on this rule. The general trend, however, has been toward the use of finer wheels than this rule would indicate. A likely explanation is that many concerns are grinding threads with a much narrower root than required by the American Standard Thread Form. This standard allows a root width equal to $\frac{1}{8}$th of the lead, yet many shops try to produce as narrow a root as possible regardless of the pitch. It is not the function of the abrasive engineer to discuss the relative merits of narrow or standard root widths, but it can be stated definitely that this does influence wheel selection. If it is necessary to maintain a narrower root width than required in the standard, it is necessary to use a finer wheel than recommended in most tables. It should be borne in mind that reduction of grit size also reduces stock removing capacity. Hence, the maintenance of a narrower root than necessary results in a sacrifice in grinding efficiency. Compensation for this can be made to some extent by utilizing higher wheel speeds and this is done in several plants, but the maintenance of extremely high wheel

Thread grinding is especially useful in producing these pump worms.

speeds is sometimes objectionable for mechanical reasons.

With resinoid wheels, coarser grits can be used for producing a root of given width. There are instances on record where resinoid wheels are being used to produce threads with roots narrower than the average diameter of the individual grains. The relatively large amount of bond used in resinoid thread grinding wheels apparently holds the grains firmly enough to allow them to be split by the diamond. This has not been observed with vitrified wheels, where the grain size should not be larger than the width of the root desired.

It seems probable that the nature of the material being ground may also have an important influence on the selection of grit size. There is reason to believe from recent observations that high speed steel and other very hard steels (55 Rockwell and harder) can be ground better with finer wheels even though the threads are of relatively coarse pitch.

Relationship of Grit Size to Root Width

Root Width	Grit size	
	Vitrified Wheels	Resinoid Wheels
.003"	No. 220	No. 180
.004"	180	150
.005"	150	120
.006"	120	120
.007"	120	100
.008"	100	100
.009"	100	90
.010"	90	90

Where necessary to maintain a root of definite width, wheels coarser than indicated in this chart are not recommended.

Grade

The best grade or hardness is determined more by the grit size than anything else. There seems to be an optimum grade for each grit size regardless of other factors. For example, large quantities of 120-J wheels are supplied for a great variety of work, but seldom are 120 grit wheels required in any other grade than J. The same is true of other grain and grade combinations. Contrary to practice on cylindrical and other conventional grinding operations, the finer grits seem to call for harder grades although there is some overlapping. The following table shows the grades most commonly associated with various grit sizes:

Vitrified	Resinoid
80-I	100-S
120-J	120-S
150-K	150-T and U
180-M	180-U
220-P	

It is interesting to note that this relatively limited assortment of specifi-

Grinding a large worm on a modern thread grinder.

cations is sufficient to take care of practically any ordinary thread grinding requirement from the coarsest down to 48 pitch. Some modifications may be desirable to obtain maximum efficiency for certain specific conditions.

Wheel Speed

Wheel speeds ranging from 6500 to 12000 s. f. p. m. are being successfully used with both vitrified and resinoid wheels. Increasing the wheel speed apparently increases the stock removing ability of a fine wheel. If a fine wheel has been selected in order to maintain a narrow root, and if the pitch is relatively coarse so that considerable stock removal is involved, it will probably be necessary to use high wheel speed. (It is under conditions like this that an increase in wheel speed reduces the amount of heat generated). Where coarser wheels (120 and coarser) are used, the higher speeds are not necessary and probably do not work as well.

On high speed steel and other sensitive steels, lower speeds are usually recommended. Lower speeds are also better where quality of finish is important.

The principal objections to high speeds involve difficulty in preventing chatter, difficulty in confining oil to point of operation and increased amount of oil and splash. High speeds also increase diamond wear.

Work Speed and Feed

These two factors must be considered together. Together they determine the rate of production per unit of time. There is still considerable controversy over the relative merits of many passes with light feed at high work speed and few passes with heavy feed at low work speed. Various combinations can be found which will produce a given amount of work in approximately the same unit of time, but there are still differences of opinion as to which method produces the best quality of work. The abrasive engineer is in-

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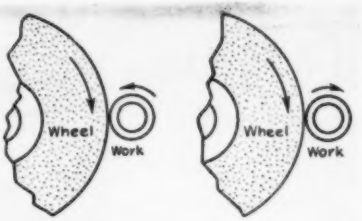
terested in this controversy only to the extent that it affects wheel selection. As a rule, the light feed-high work speed method calls for finer and harder wheels than the other.

There is some evidence to indicate that on high speed steel and other sensitive steels, the light feed-high work speed method may be better, but there are some cases where the other method is being used with good results. On alloy steels and structural steels which are tough rather than hard, the slow speed-few passes method is usually more economical. On material of this character, pitches as coarse as 10 or 12 are sometimes ground from the solid in two passes and sometimes in a single pass at a work speed of 1½ to 2 feet per minute. Screws of 18 pitch and finer are often ground from the solid in a single pass.

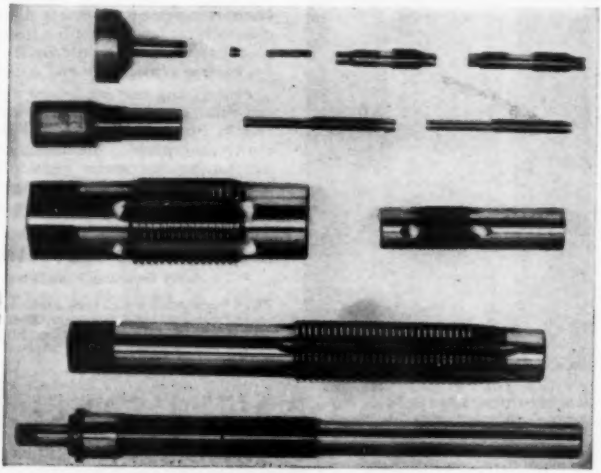
Direction of Work Rotation

The direction of wheel rotation on thread grinding machines is the same as on the conventional cylindrical grinding machines. At the point of contact with the work, the wheel runs down. Thread grinding can be done with the work running in either direction. Where the work rotates in the same direction as the wheel (as on a cylindrical grinder) the cut corresponds to the so-called "up-cut" on a milling machine. When the work runs in the opposite direction, it corresponds to a "climb-cut". Where more than one pass is required to grind a thread it is customary to grind the alternate passes with climb-cut and up-cut rotation. This is made clear in the accompanying sketches.



Climb-Cut *Up-Cut*

There is quite general agreement that the up-cut method produces a better



A few typical thread grinding jobs.

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finish, and where more than one cut is employed, the cycle is frequently arranged to finish on the up-cut.

Distribution of In-Feed

Where more than one cut is used, it is important to study carefully the distribution of the amount of feed between the cuts in order to obtain the best results. Let us assume that it is desired to grind a 12-pitch standard screw from the solid in two cuts. The total depth of thread is .054" which means that a total radial feed of .054" (plus allowance for wheel wear) is to be properly divided. If too heavy a roughing cut is taken in the expectation that this will leave a minimum of work to do in the finishing cut, the point of the wheel may break down on the roughing cut, leaving an excessive amount of work for the point to do on the finishing cut. For example, it has been found from experience on 12-pitch screws that a feed of approximately .036" for the roughing cut and .018" for the finish is a good split.

Diamonds and Truing

For best results, the condition of the diamonds and the truing cycle are extremely important. Good results cannot be produced with dull diamonds, or where the diamond is loose in its setting. Many difficulties such as chatter, poor thread form, and burning frequently can be traced to the diamond and this should be kept in mind constantly.

Frequent light truing usually results in less diamond wear. Where wheel is allowed to wear badly before resorting to truing, there is a temptation to use a heavy diamond feed and this is likely to accelerate diamond wear.

Because of the high wheel speed employed, diamond wear is apt to be relatively rapid on many thread grinding jobs. Diamonds must be turned and adjusted frequently. It is poor economy to use diamonds after they are badly worn. It is better to return them rather frequently to the diamond tool maker for reconditioning.

Truing should not be done with the wheel dry. This increases diamond wear and the heat may crack the diamonds. A fairly large stream of oil is recommended during truing.

The type of diamond nib recommended by the machine maker should be used in order to assure proper fit in the truing device.

Mounting and Balancing

Thread grinding wheels must be carefully mounted and balanced if best results are to be obtained. At the high speeds usually employed, any slight deviation from perfection in the matter of trueness or balance is likely to show up in the quality of the work.

The best results cannot be assured unless the wheel is first trued while in the wheel sleeve before balancing. This is because of the difference between the size of the hole and the wheel sleeve pilot, permitting slight eccentricity in mounting. Where several thread grinding machines are used, it is sometimes advantageous to provide a special "truing machine" or lathe built to accommodate the wheel sleeve, and with proper diamond fixtures. This saves tying up the grinding machine while the wheel is being trued and balanced, and reduces diamond wear on the grinding machines. This method obviously requires a number of extra wheel sleeves in which the trued and balanced wheels can be stored until needed.

Truing the Wheel

When truing the wheel, it is not wise to take too heavy cuts. This accelerates diamond wear and also disturbs the structure of the wheel near the edge so that it may tend to break down more rapidly than it would if more moderate cuts were taken.

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Coolant or Lubricant

The importance of an adequate flow of grinding oil of proper quality cannot be overemphasized. It has been said, and we believe rightly, that this is just as important as the selection of the correct wheel. It is a fact that changes in the grade of oil, or in the adjustment or design of the nozzles have often marked the difference between successes and failures on jobs, even after abrasive engineers had submitted their best wheel selections for the jobs.

One important function is the responsibility of the user. That is to keep the oil clean. All too frequently, cases are encountered where the settling tanks are not cleaned often enough. The large amounts of steel removed from the work accumulate more quickly than most users realize. Contaminated oil cannot produce good finishes and cannot function properly in keeping the wheel free from loading.

For keeping the oil clean and in good condition, various makes of filters and separators are on the market, and where the best results are desired, it is recommended that their features be investigated.

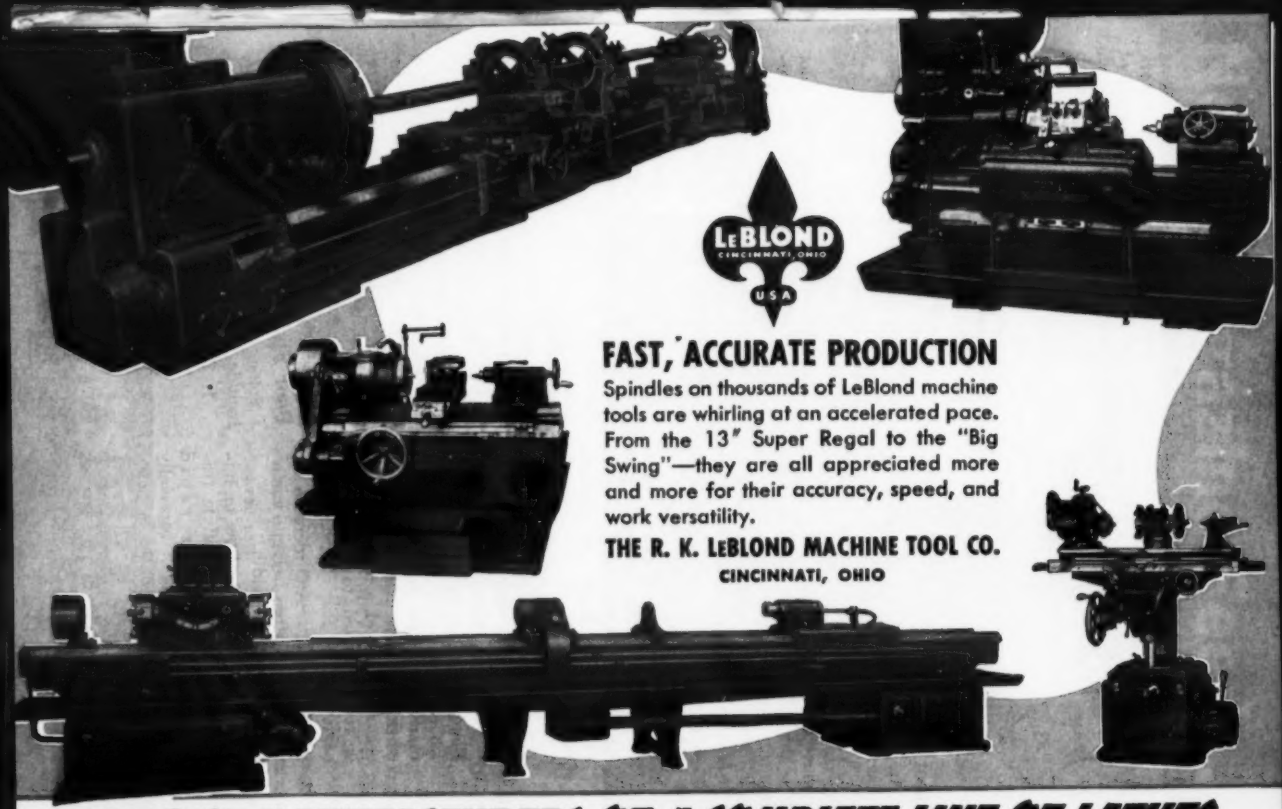
Summary

Because thread grinding has expanded so rapidly, there is very little printed matter on the subect and the operator who wants to learn all he can about it, finds himself at a loss as to where to turn for help. Therefore, this article will perhaps be more helpful if we summarize by telling briefly how to overcome some of the difficulties most commonly encountered in thread grinding.

Burning

Excessive heat or burning, as indicated by discoloration of the work, is probably the most common trouble encountered. The principal causes are:

1. **Inadequate flow of coolant or improper adjustment of outlet nozzles.** Make sure valve is open fully and adjust outlets so that oil will strike work where it will do the most good. Slight changes sometimes make a big difference in results.
2. **Too heavy feed or too fast work speed.** Heat usually increases with amount of stock removed per unit of time. There is a limit to the rate at which stock can be removed even under the best conditions. This varies with the class of material. Possibly you are trying to work too close to the border line. Try a slightly slower work speed or a somewhat lighter feed. Here, too, a slight change might be all that is necessary to overcome the trouble.
3. **Too slow work speed.** On hardened steel, burning is sometimes eliminated by increasing the work speed and reducing feed in proportion.
4. **Wheel speed.** Where a relatively fine wheel is being used to maintain a narrow root and where the pitch is relatively coarse so that a large amount of material must be removed, a higher wheel speed often reduces the tendency to burn. In other cases, reducing the wheel speed will reduce burning, but this may cause the edge to wear more rapidly.
5. **Grit size.** On hardened high speed steel, a change to a finer grit, even in a harder grade, will often reduce the danger of burning.
6. **Direction of work rotation.** More heat is usually generated by the "climb-cut" than the "up-cut" direction. (See sketch.) Try to rearrange cycle so that finishing cut will be made on the "up-cut." Try reducing amount of feed a little on the climb-cut and add it to the up-cut.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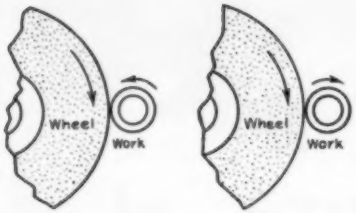

Climb-Cut *Up-Cut*

Root Width

An accompanying chart shows the allowable root widths for U. S. Standard Thread Forms of various pitches. On many classes of work it is customary to maintain narrower widths than this. Maintenance of root width, therefore, often presents a real problem. These factors should be studied if trouble is being encountered:

1. **Grit size.** It is not practical to maintain a very sharp edge on a wheel if it is too coarse. The table shows the coarsest grits which are recommended for producing root forms of various widths.

   On moderately coarse pitches (12 to 18) a coarser wheel will often hold the desired form better than one which is too fine.
2. **Bond.** As a general rule, resinoid wheels maintain a better edge than do vitrified wheels. If the work does not call for extreme accuracy of lead, a resinoid wheel is recommended to hold a fine edge.
3. **Wheel speed.** An increase in wheel speed often helps to maintain narrow root width.
4. **Coolant.** Inadequate flow or improper application of oil is frequently responsible for rapid breakdown of edge, especially where a resinoid wheel is being used.
5. **Distribution of feed.** If you take too heavy a roughing cut, hoping this will leave a minimum of work for the finishing cut, the point of the wheel is likely to break down in the roughing cut, leaving an excessive amount of material for point to remove on the finishing cut. On 12 pitch U. S. Standard screws, a feed of .036" for the roughing cut and .018" for the finish is usually satisfactory. Some experimenting may be required to find the best combination for other pitches.

Thread Form
(Other than root width)

Poor thread form (other than root width, which is discussed in the preceding paragraphs) is usually attributable to improper truing. If the diamond is badly worn or loose in the shank, it is impossible to true a correct form on the wheel.

Do not try to take too heavy cuts when truing a resinoid wheel. The diamond, if dull, might cause enough deflection of the wheel to affect the form.

Lead Error

This occasionally occurs when using resinoid wheels, especially if the thread is precut and distorted in hardening. Also on large diameter work there is likely to be some slight springing of a resinoid wheel near the end of the thread where the edge of wheel is not fully supported on both sides. Where lead error is being experienced which cannot be tolerated, a change to vitrified wheels is recommended.

Poor Finish and Chatter

Some of the more common causes include:

1: **Diamond lines** can be distinguished from abrasive scratches because they are very evenly spaced. If objectionable, they can be eliminated or reduced by us-

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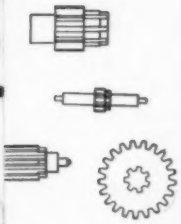

IPLES OF WORK
can be automatically
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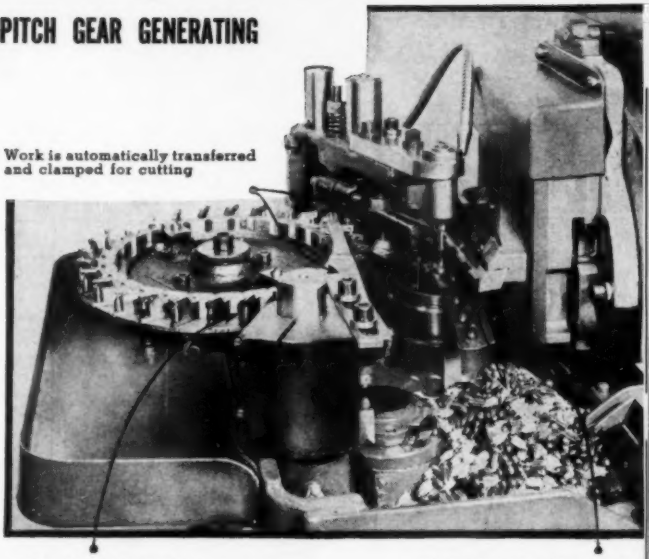

Work is automatically transferred and clamped for cutting

Blanks are loaded here

Work automatically ejected

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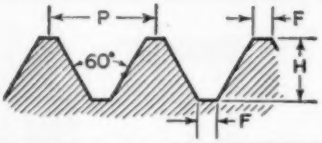


Number of Threads per Inch (Commonly called Pitch)	*Pitch or Lead P*	*Depth of Thread H*	*Width of Flat F (Commonly called Root)*
80	.0125	.0081	.0016
72	.0139	.0090	.0017
64	.0156	.0101	.0019
56	.0178	.0116	.0022
48	.0208	.0135	.0026
44	.0227	.0147	.0028
40	.0250	.0162	.0031
36	.0278	.0180	.0034
32	.0312	.0203	.0039
28	.0357	.0232	.0045
24	.0416	.0270	.0052
20	.0500	.0325	.0062
18	.0555	.0361	.0069
16	.0625	.0406	.0078
14	.0714	.0464	.0089
13	.0769	.0499	.0096
12	.0833	.0541	.0104
11	.0909	.0590	.0113
10	.1000	.0649	.0125
9	.1111	.0721	.0139
8	.1250	.0811	.0156
7	.1428	.0928	.0178
6	.1666	.1082	.0208
5	.2000	.1299	.0250
4½	.2222	.1443	.0278
4	.2500	.1624	.0312

Pitch P = 1 ÷ number of threads per inch.
Basic Depth H = 0.6495 x Pitch.
Basic Flat F = 0.125 x Pitch.

ing slower diamond feed or lighter feed when truing the wheel, especially on the final passes.

2. **Surface roughness** is often caused by too heavy cut or too high work speed on finishing pass.

Erratic scratches can be caused by dirty grinding oil. Clean tank frequently.

3. **Chatter** can be due to several causes. If wheel is out of bal-

Torque Wrench

MORE ACCURACY
LIFE
SPEED
3 DIALS

NO FRICTION
ADJUSTMENTS
MOVING PARTS
FRAGILE MECHANISMS

Constructed for exacting laboratory work or continuous production use.

A practical wrench correctly engineered.

PERMANENT ACCURACY.

A capacity and size to fit your needs.

State capacity needed.

PIONEER MANUFACTURERS OF ACCURATE MEASURING WRENCHES

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

ance, true it as carefully as possible; remove it from machine and balance it; then re-true lightly.

An attempt to true too sharp an edge on a relatively coarse wheel usually results in a ragged edge which sometimes causes chatter in the root. Try truing a slight flat on the edge.

Too high work speed, or any combination of conditions whereby wheel is taxed beyond its stock removing capacity may cause chatter.

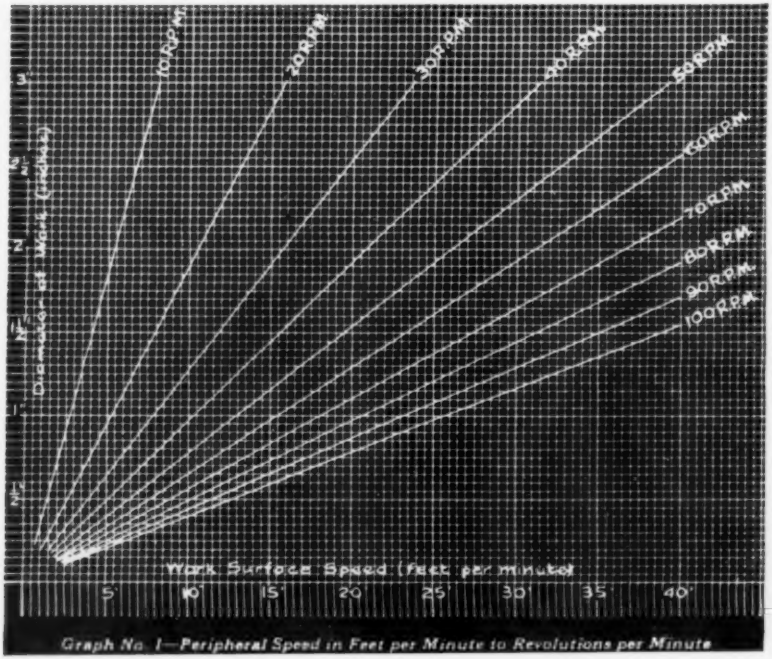
General Suggestions

Mounting, truing and balancing. Be sure faces of flanges and sides of wheels are clean and free from any foreign material. Thin gaskets such as are provided by the machine maker, or blotters supplied by the wheel maker should be used. Do not use both at once.

Tighten flanges evenly and not too tightly.

If wheel sleeve is of the removable type, balance the whole unit carefully. It usually saves time when balancing a new wheel to first remove the balancing weights entirely and start "from scratch." The wheel should be carefully trued **before** balancing to make sure that it runs "true" on the wheel sleeve, otherwise the balancing will not do much good.

True wheel carefully and do not use too heavy diamond feed. This applies to truing before as well as after balancing.



Graph No. 1—Peripheral Speed in Feet per Minute to Revolutions per Minute

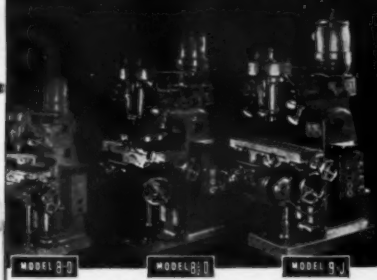
MODERN GORTON MACHINES

ASSURE FUTURE ECONOMIC SAFETY

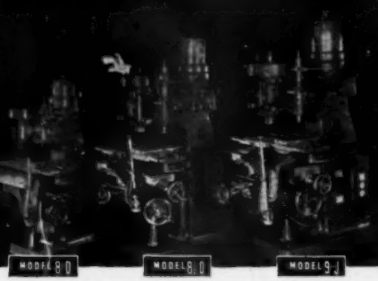
Purchase the Modern 1942 Machine Tools—needed for present emergencies—that can later be used to reduce your production costs . . . help you maintain profits in highly competitive markets.

Use George Gorton Specialized Engineering Service to assist you in the selection of the right cost-reducing equipment for die making, engraving and vertical milling. Recommendations without obligation.

Vertical Milling Machines ★ GORTON SUPER-SPEED ★ Duplicating Machines



Light Production Milling—Tool Work—and Jig Boring



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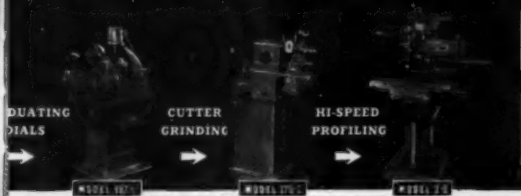
Engraving Letters and Designs from Templates

For Reproducing Intricate Dies from Models

SPECIAL PURPOSE MACHINES AND ACCESSORIES



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No. 1400-A—Super Speed Vertical Milling Machines
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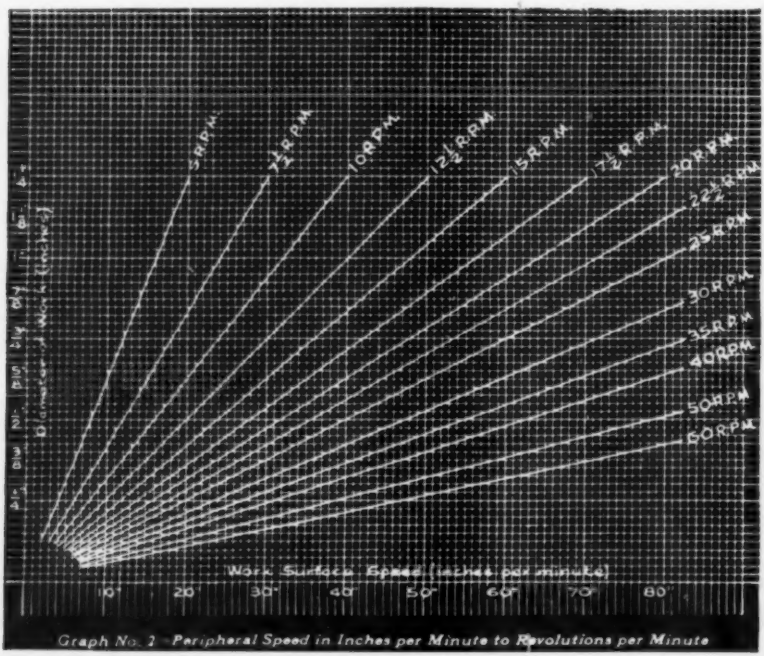
No. 1580-A—Pantograph ENGRAVING Machines
No. 1317-D—Time-Saving ACCESSORIES, Small Tools

GEORGE GORTON MACHINE CO.

1317 RACINE STREET, RACINE, WISCONSIN, U. S. A.

WHEEL SPEED — Surface Speed to Revolutions per minute for Various Wheel Diameters.

Wheel Diam.	*Surface Speed (Feet per Minute)*							
	7500	*8000*	*8500*	*9000*	*9500*	*10000*	*11000*	*12000*
15	1910	2035	2165	2290	2420	2560	2800	3060
16	1790	1910	2030	2150	2270	2385	2625	2865
17	1685	1800	1910	2020	2135	2250	2470	2695
18	1590	1700	1800	1910	2015	2120	2235	2545
19	1505	1610	1710	1810	1910	2010	2210	2410
20	1430	1530	1620	1720	1815	1910	2100	2290



Graph No. 2 Peripheral Speed in Inches per Minute to Revolutions per Minute

BOUT of the O'TOOLS

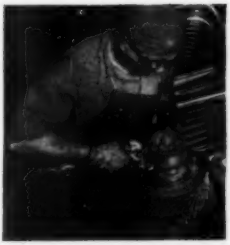
10 ROUNDS—AIR VS. HIGH-CYCLE GRINDERS

ROUND 2 GOES TO THE "FLY-WEIGHT" TOOL WITH THE "HEAVY-WEIGHT" PUNCH

SET-UP:

Sanding and buffing auto and truck body parts. Plant already had both Rotor AIR and HIGH-CYCLE Tools. Needed 15 more tools.

Air supply was ample. Called in the *Rotor Analyst* for unbiased opinion on AIR vs. HIGH-CYCLE.



SCORE:

AIR outpointed HIGH-CYCLE these ways:

1. ***Easier to handle.*** Their exceptionally light Rotor AIR grinders weigh only 9¾ lbs. compared to 16 lbs. for HIGH-CYCLE grinders. Easy to move around and reach work at all angles.

2. ***10% Greater production*** due to lighter weight and maneuverability.

3. ***Fine speed control.*** By cracking throttle, speed of AIR tools can be easily controlled to remove weld flashes without burning through thin metal.

John Clegue of Cleveland

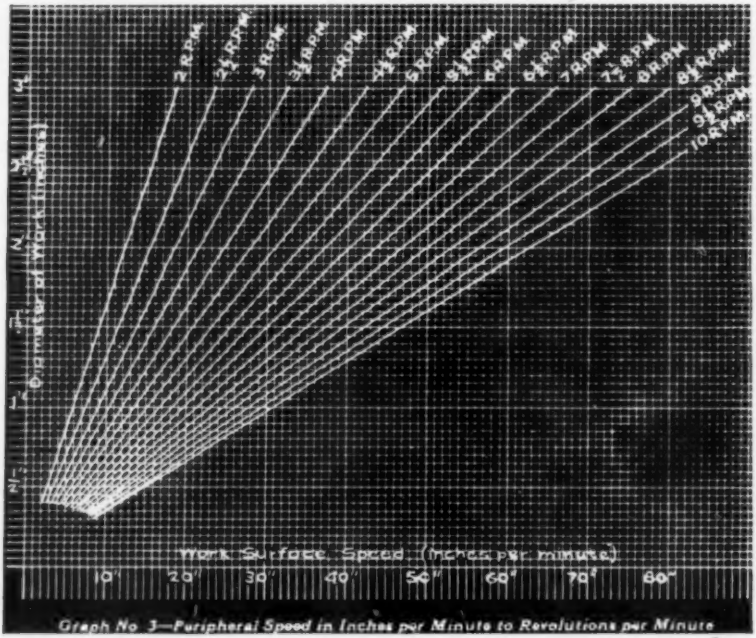
WANT MORE PUNCH FOR SPEED NOW?

The *Rotor Analyst* has an unbiased plan of action to boost production with portable tools — at a minimum of investment cost. Shops using all types of tools have benefited from his practical knowledge and unbiased analysis. His service is yours for the asking.

The Rotor Analyst has 65 different AIR tools and 59 different HIGH-CYCLE tools with which to solve your problems.

ROTOR TOOL

HIGH CYCLE



Graph No. 3—Peripheral Speed in Inches per Minute to Revolutions per Minute

Wheel speed. Wheel speed on thread grinding varies from 7500 to 12,000 surface feet per minute. Most thread grinding wheels are strong enough to stand safely even 12,000 s.f.p.m. but some of the coarser ones may not be. The wheel maker shows the maximum operating speed on each wheel. Do not exceed this limit.

The most common speeds are between 8000 and 10,000 s.f.p.m. On high production commercial work, speeds up to 12,000 s.f.p.m. are generally used. Slower speeds are sometimes used for finish grinding.

The most important thing to remember, once the best speed for a given job is established, is to **maintain** a reasonably constant surface speed by increasing r.p.m. as the wheel wears down. The accompanying conversion table should be of help in this connection.

Work speed. It is not practical to list the best work speeds for all classes of work. Perhaps a good place to start would be with a work speed of about 2½ feet per minute on work of medium pitch where it is desired to finish from the solid in two or three passes. Some people prefer much higher work speed with very light feed on hardened high speed steel. Others prefer fewer passes with heavy feed which naturally calls for slower work speed.

Once a satisfactory work surface speed has been found for a certain pitch and kind of material, the same surface speed will also be satisfactory on other diameters within a reasonable range. The accompanying graphs will be help-

Trustworthy in Defense

Operate multiple spindle Bar or Chucking Automatics on a 24-hour Defense schedule, push them to the limit of speeds and feeds that tools will safely stand—then you find out how trustworthy they are.

Under just such gruelling conditions, in arsenals and among suppliers of billions of Defense parts, hundreds yes, thousands of Acme-Gridley automatics will continue trustworthy for "the duration" and years after—

***Because* Acme-Gridley design factors that insure accuracy and stamina were thought out and PROVED out far in advance of today's emergency needs.**

NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, O.

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

Maximum Operating Speeds Recommended for New Wheels

		(Ex-Cell-O) 18"x3/8"x9"	(Jones & Lamson) and Landis 20"x3/8"x10"
Vitrified 80 and finer	Grade H	1700 r.p.m.	1530 r.p.m.
	Grade I	1910 r.p.m.	1720 r.p.m.
	Grade J and harder	2000 r.p.m.	2290 r.p.m.
Resinoid 80 and finer	Grade O and harder	2545 r.p.m.	2290 r.p.m.

Typical Wheel Recommendations for Thread Grinding Machines

Class of Work	Threads per Inch	Specifications for Precision Work	Specifications for Commercial Work
Worms and Lead Screws (Acme and Worm Threads)	4 to 6 (Precut)	80-I s.f.a. vit.	
	6 to 12 (Precut)	120-J s.f.a. vit.	
	12 to 16 (from Solid)	120-J s.f.a. vit.	
Precision Screws (Fine Pitch)	32 to 40	220-M s.f.a. vit.	
	Finer than 40	320-O f.a. res.	
Whitworth Form Threads	8 to 16	120-J s.f.a. vit.	
	18 to 24	150-K s.f.a. vit.	
Screws and Studs (Heat Treated Alloy Steel) American National Form Threads High Production	8 to 12		100-S f.a. res.
	14 to 20		150-T f.a. res.
	24 and Fin		180-T f.a. res. or 180-U f.a. res.
Taps (High Speed Steel) American National Form Threads	4 to 12	120-J s.f.a. vit.	100-S f.a. res.
	14 to 20	150-K s.f.a. vit.	150-T f.a. res.
	24 to 36	180-M s.f.a. vit.	180-T f.a. res.
Taps (High Speed Steel) Acme Threads	2 to 4 (Precut)	80-I s.f.a. vit.	
	6 to 10 (Precut)	120-J s.f.a. vit.	
	12 to 16 (Precut)	150-K s.f.a. vit.	
	12 to 16 (from Solid)	120-J s.f.a. vit.	
Taps (High Speed Steel) American Standard Pipe Threads	8 to 18		100-S f.a. res.
	27 and Finer		150-T f.a. res.
Internal Threads (Tool and Alloy Steel Hd.) American National Form Threads	6 to 16 (Precut)	120-K s.f.a. vit.	100-W f.a. res.
	20 to 24 (Precut)	220-M s.f.a. vit.	150-W f.a. res.
Internal Threads (Tool and Alloy Steel Hd.) Acme Threads	2 to 8 (Precut)	80-J s.f.a. vit.	
	10 to 20 (Precut)	120-J s.f.a. vit.	

s.f.a. = special fused alumina vit. = vitrified bond

f.a. = regular fused alumina res. = resinoid bond

This above table shows average specifications being used for various classes of thread grinding and should be of assistance in selecting wheels for any new operations. The grading system is that used by the majority of grinding wheel manufacturers.

Standard Wheel Sizes

For Jones & Lamson and Landis machines .....20" x 3/8" x 10"
For Ex-Cell-O machines .....18" x 3/8" x 9"

All wheels supplied with sharp 60° bevelled edge unless otherwise specified. Internal wheels must be made to order to suit individual requirements.

ful in determining the revolutions per minute at which work of various diameters should be run in order to obtain any desired surface speed.

Coolant. Keep the grinding oil clean. Remove the settlings frequently. Good work cannot be produced with dirty oil.

Keep outlets properly adjusted. It is usually necessary to readjust them with every change in work size. A slight adjustment will often eliminate burning and also reduce objectionable

Initial machining on outside surfaces of airplane engine connecting rods. Typical of the kind of jobs ideal for tools made of MO-MAX steel.

MO-MAX

The Original Commercial

MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

Tungsten-Saving (Less than 2%W)
Commercially Proved—9 years
Thousands of Tons Produced
Millions of Tools Made
Superior Cutting Quality
Standard with 13 Leading Mills

"Mohican"	Atlas Steels, Ltd. Welland, Ontario, Canada
"Vul-Mo"	Vulcan Crucible Steel Co. Aliquippa, Pa.
"Mo-Tung"	Universal-Cyclops Steel Corp. Bridgeville, Pa.
"S.T.M."	Simonds Saw & Steel Co. Lockport, N. Y.
"Tatmo"	Latrobe Electric Steel Co. Latrobe, Pa.
"Mogul"	Jessop Steel Company Washington, Pa.
"Rex-T-Mo"	Halcomb Steel Company Syracuse, N. Y.
"Bi-Mol"	Henry Disston & Sons, Inc. Philadelphia, Pa.
"Rex-T-Mo"	Crucible Steel Co. of America New York, N. Y.
"Mollie S"	Columbia Tool Steel Company Chicago Heights, Illinois
"Star Max"	Carpenter Steel Company Reading, Pa.
"Mo-Cut"	Braeburn Alloy Steel Corp. Braeburn, Pa.
"Bethlehem HM"	Bethlehem Steel Company Bethlehem, Pa.
"LMW"	Allegheny Ludlum Steel Co. Pittsburgh, Pa.

Formula for General Purpose

MO-MAX

MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

Carbon	.80
Molybdenum	8.50
TUNGSTEN	1.50
Chromium	4.00
Vanadium	1.00

For booklet containing technical data, write

THE CLEVELAND TWIST DRILL CO.

CLEVELAND, OHIO

2895

splashing of the coolant.

A little time spent in making a simple splash guard for a special job will often permit the full flow of oil without trouble, thus permitting maximum rate of stock removal.

Do not shut off entirely when truing or dressing. A little oil reduces diamond wear and the danger of cracking.

Work Speed

Instructions for Using Speed Conversion Graphs—

Select the graph that covers the desired conditions. (Note that work surface speed on Graph No. 1 is in **feet** per minute. On the others it is in **inches** per min.)

Find diameter of work in left vertical margin. Trace corresponding horizontal line to where it intersects diagonal line representing r.p.m. of work. From point of intersection, trace vertical line to bottom of chart and read surface speed in **feet per minute** or **inches per minute** as case may be.

Look to EASTERN for COOLANT PUMPS

Eastern Engineering Company, manufacturer of world-famous specialized pumps, offers a complete line of Coolant models in all sizes and types—each with the rugged, trouble-free dependability which has made the name of Eastern respected all over the world.

Write for complete information and prices.

Proven performance—Continually growing demand for Eastern Coolant Pumps has made necessary an expansion of our production facilities. Increased capacity enables us to maintain prompt shipments.

EASTERN ENGINEERING COMPANY
42 Fox St., New Haven, Conn.

For Defense Production...

PANTO
COMBINED ENGRAVER, ELECTRIC MARKER, and ACID ETCHER

Compact pantographic bench-type machine, with interchangeable heads, for wide range of work. Illustration shows engraving head attached.

CUTTER GRINDER

Accurate inexpensive unit for sharpening single-lip engraving and routing cutters.

MASTER COPY TYPE

2 and 3-dimensional brass and 3-dimensional plastic, for engraving, marking, die cutting.

CUTTERS AND ENDLESS BELTS FOR ALL TYPES OF ENGRAVING MACHINES

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H. P. PREIS ENGRAVING MACHINE CO.
157A SUMMIT ST. NEWARK, NEW JERSEY

EPENDABLE CUTTERS INCREAS
UTPUT ON DEFENSE PRODUCTIO

—To obtain **More** and **Better** work put **reliable** Brown & Sharpe Cutters on every job . . . they help good machines give maximum output.

Catalog No. 34 shows the complete line.
Copy gladly sent on request.

B&S
Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE CUTTERS

he full production capacity of our plants
ie largest in the world devoted exclu-
vely to the manufacture of milling ma-
hines . . . is dedicated to national security.

•

EARNEY & TRECKER CORPORATION
Milwaukee, Wisconsin, U. S. A.

One of a series of advertisements describing specialized machines — originated, designed and built by Kearney & Trecker Corp. to assure the quality of Milwaukee Milling Machines under mass production.

Specialized machines — modern marvels of engineering — are a basic part of the carefully planned and coordinated production facilities, functioning a full 168 hours per week, which make it possible to manufacture Milwaukee Milling Machines in volume to the highest standards of machine-tool precision and quality.

This 15 ton, seven-spindle production unit was designed for machining T slots in milling machine tables. It eliminates five independent cuts and increases production by more than 550% over ordinary methods. But what is more important — it insures a higher degree of accuracy than was previously obtainable.

Milwaukee MILLING

. . . GET INTO TODAY'S PICTURE!

PRECISION GRINDING of threads—either from the hardened solid material or on pre-cut threaded work after heat treat—is in fast increasing demand. The speedy production and repeated accuracy that precision thread grinding assures are becoming absolute requirements in the machining of many metal parts urgently needed today for war purposes.

Eight standard styles of precision thread grinders are made by Ex-Cell-O Corporation, original designers and manufacturers in the United States of precision thread grinders for commercial use.

EX-CELL-O CORPORATION • DETROIT, MICH.

XLO

EX-CELL-O means PRECISION

MANUFACTURERS OF **PRECISION MACHINE TOOLS**

One of the U. S. Army's Famous Flying Fortresses. (Photo—Courtesy Boeing Aircraft Company)

Industry Is Going "Great Guns"

By PAUL McCREA

Written and published in "Nation's Business" before war was forced upon us in the far East, this reassuring story highlights some of the typically American achievements of our defense industries. It is a safe prediction that inspired with the new spirit of national unity, American industry will now cut loose and show the world some entirely new standards of production efficiency and capacity. The nation's defense industries are really our first line of defense and the men in the shops will never let down the men at the fighting front. The story is reprinted by special permission. Editor.

WILLIAM S. KNUDSEN, of O. P. M., is a blunt man. He called K. T. Keller, Chrysler Corporation president, on the telephone.

"K. T., will you make tanks?"

"Yes, Bill. Where can I see one?"

The date was June 8, 1940.

In that two line dialogue is compressed the whole kernel of the American defense effort: the urgency, the willingness and the inexperience that have characterized our struggle to become a military power.

As Knudsen spoke, young corn murmured in peaceful growth in a field 12 miles from Detroit. In contrast, across the fields of France, the incredible blitzkrieg raged relentlessly toward Paris. Belatedly aroused, our Government wanted tanks.

It is a paradox that a nation christened in the blood of an eight year revolution should spend the rest of its life with its head under a pacifist bushel; that a people who believed the right to bear arms worth protecting by constitutional guarantee should ignore the warnings of those who urged them to exercise that right. Far-seeing groups —the United States Chamber of Commerce among them—have long noted this deficiency and cried out for national preparedness.

Amorous cats on back fences have drawn a larger audience.

We have preferred to listen to those who assured us that, in time of need, "a million men would spring to arms overnight." Thus, as always, when the President proclaimed an unlimited emergency, the patriotic million poised uncertainly. There were no arms to spring to.

So the nation wanted tanks. Mr. Keller might see one at Rock Island Arsenal.

Accompanied by mechanical and engineering executives, he went there. His party saw a tank. They rode in it. They measured here and probed there. They returned to Detroit lugging 186 pounds of blueprints over which 197 men worked for four weeks, analyzing, estimating, figuring, making layouts.

Shortly that corn field near Detroit knew a blitzkrieg of its own. Steam shovels came gouging craters. Engines started puffing steel girders into position. And throughout the land arose a cacophony of calamity. The Government and people wanted tanks. And still there were no tanks.

September. October. November. December brought vicious weather. Workmen gave up holidays and weekends to stand in knee deep slush pouring 51,000 tons of concrete. It snowed. They blew on stiff fingers and erected 6,500 tons of steel in 70 days. They were putting up a building two blocks wide, five blocks long. You could put four Yale bowls in it if you wanted to—but the Government wanted tanks.

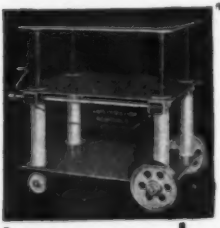
Before the building was done, they had some—two 25 ton samples. Eleven months after the first ground was broken they had more. By then, 1,000 heavy machines, 8,000 tools, gauges and fixtures had been designed, built and put into operation. Today from that former cornfield, tanks are pouring out at the rate of 15 a day. Of 79,000 vehicles of all kinds contracted for, Chrysler has completed 60,000.

All right. So we have tanks.

Not as many as the Germans have, or the Russians. Not as many as we need. But more than we would have if industry wasn't going great guns. More than any other country could have had in the same time if it had started from scratch as we did.

Those who complain that our shipments of materials and supplies to Europe are only a trickle—a statement that, on its face, seems damning—forget that the length of the race affects the time of running. We have felt, in our conceit, that we as a people were more mechanically gifted, smarter, more efficient than any people anywhere.

Within limits, that estimate is correct. If it were not, our defense program would blossom today only in the sonorous oratory of statesmen passing appropriation bills and warning the



STYLE A

FOR A MORE EFFICIENT NEW YEAR

THE HAMILTON PORTABLE ELEVATING TABLE

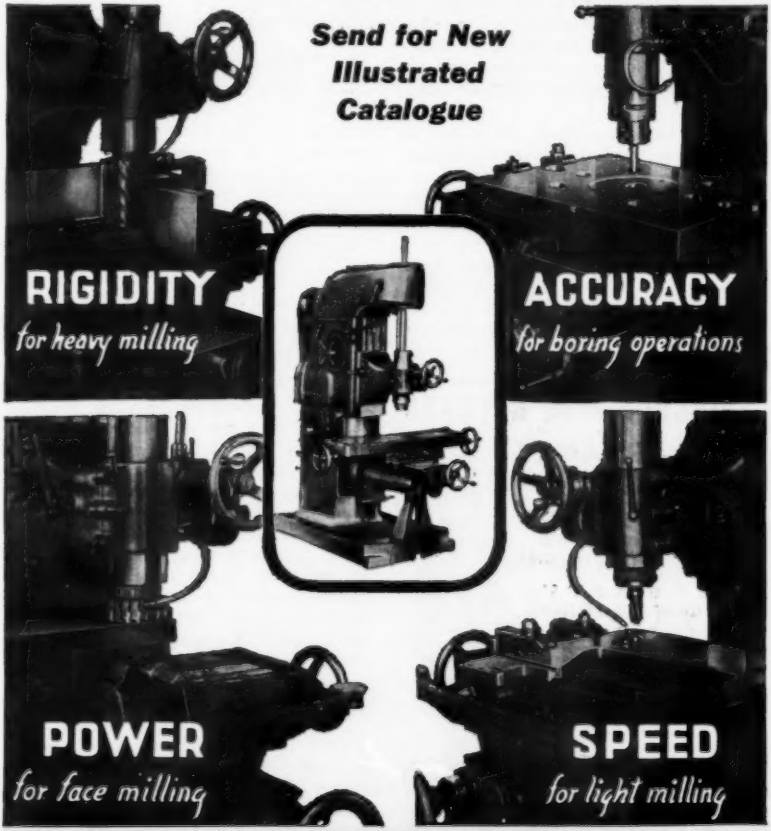
"PORTELVATOR"

Not a shop accessory . . . but a shop necessity . . . for lifting . . . for bringing tools right to the job . . . as a bench . . . as a support.

1 to 20 ton, hand or power operated.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

4 BIG FEATURES of the Knight Milling Machine



W. B. KNIGHT MACHINERY CO.
3924 W. PINE ST. • ST. LOUIS, MISSOURI

world that we have a tremendous military machine "on order."

No one expects a pool shark to be a great basketball player merely because he is used to dropping a ball through a hole. Yet we have permitted that kind of vagary to color our defense expectations. We overlooked the fact that a lipstick and a shell primer set off different kinds of dynamite, and that the man who made the former would need to learn to make the latter.

Today he is learning. It is not an easy lesson because a lipstick, whatever the ladies may think, is not a precision instrument. A shell primer needs to be accurate within a few thousandths of an inch.

Neither is it easy for an agricultural implement factory to turn out combat wagons and gun carriages; for a refrigerator plant to make airplane parts; for a printing press maker to make howitzer recoil mechanisms; a pipe organ plant to fashion saddle frames; or a steel casket plant to make bomb casings.

Such changes should not be possible at all except for the productive ability and ingenuity of American industry. Even then it's a tremendous job; much bigger than any of us realize.

The Cow Pasture Phase

Take anti-aircraft guns!

In February, 1941, the Firestone Tire and the Chrysler Co.'s. were awarded a contract to do the necessary engineering and designing for the construction of two Bofors Anti-Aircraft Gun plants and subsequent production of gun carriages.

Five months later they delivered two guns to the War Department.

"And that," cries the critic, "is an example of our boasted mass production. Two guns in five months! What kind of a triumph is that?"

Well, let's see.

The first need in building machine guns is drawings of the parts. Firestone got them late in February from Sweden, Canada and England—scaled in millimeters. American machinists work in inches. Shortly afterwards an actual gun arrived from England.

On the third floor of the Mechanical Building—space formerly used for pattern storage — 100 engineers and draftsmen went to work redrawing plans and changing centimeters to inches. Renovating the workroom, installing lights and equipment took two weeks.

Out-of-doors, other workmen were busy. Two gun plants were needed. Ground was broken May 1. Thirty-five working days later, machinery was being moved into the smaller unit. The larger unit—625 by 326, two stories high—was mostly under roof, the steel work completed.

In the old tool room, something more than a copying operation was going on.

We Know How Much You Need Davis Boring Tools

We want to sincerely thank all you Davis Boring Tool customers for the *patience* you have shown us in this national emergency.

You have known that while our production has been stepped up until it is *double* that of a year ago, most of it is still necessarily on vital Defense work—and yet you have watched your own delivery delays with a spirit of understanding and cooperation that is typically American.

We are keenly aware of your civilian needs for Davis Boring Tools. And we want you to feel that we are doing everything humanly possible to get these tools to you. Thanks again for your patience and cooperation.

DAVIS BORING TOOL DIVISION

Larkin Packer Co., Inc. • St. Louis, U. S. A.

DAVIS BORING TOOLS

American ingenuity was redesigning as it went along. When the plans-in-inches were ready, they called for 25 per cent fewer parts than are used in the foreign-made Bofors gun; welding was substituted for riveting on the gun carriage, adding strength, reducing cost; a large swivel bearing was redrawn to use commercial ball bearings which could be made on existing machinery from standard bearing material. Another suggestion speeded broaching operations, adding 50 per cent to efficiency, avoiding purchase of additional equipment.

Such changes are expected to save more than $1,000,000 in fulfilling the contract.

All that in five months!

Or take M-5 tank guns.

On October 15, 1940, New Jersey breezes played with a wheat field outside Elizabeth. Three months later a building stood there. On March 3, power was turned on and, although the plant was only ten per cent tooled up, American Type Founders started making M-5 tank guns.

Reduced to essentials, the story is as simple as that. Unfortunately overlooked is the tedious tale of experience, ingenuity and adaptability that makes the simplicity possible. American Type Founders, in taking the contract for tank guns, counted heavily on past experience with sub-contracting. The gun itself involves 30 sub-assembly jobs. Today 20 companies supply major parts requiring no assembly. Coordinating production of 51 separate concerns is not a job for novices. American Type Founders knew the technique, employed it, and defense took another bound forward.

These aren't isolated instances. In Vancouver, Wash., the Aluminum Company of America sliced 125,000 carloads of dirt off a hilltop cow pasture; hauled materials from 40 states to build an aluminum plant that will cover 55 acres. At Bayonne, N. J., a $1,000,000 plant, built in 100 days by the Electric Boat Company, is turning out motor torpedo boats; in New England a six story factory is making arms on what, four and a half months before, was a weed-grown vacant lot; in Kansas, a plant 1,000 by 330 feet is turning out bomber parts where 13 months ago farmers were plowing.

At Milwaukee, Geuder, Paeschke & Frey Company found it necessary to enlarge their plant because of defense orders. But enlargements take time. Wrecking the old buildings and putting up new ones would have delayed production. Moreover steel and other building materials were extremely hard to get. Ingenuity was available, however.

The company bought an old building, 312 by 65 feet, tore it down and rebuilt it over the existing plant which continued to operate. When steel structural shapes of the dismantled build-

Millions of Strokes

FOR DEFENSE

In speeding up machines for maximum production, *remember* the vital need for accurate production count as given by PRODUCTIMETERS...dependable ...economical...ruggedly built to withstand hard usage and long service.

Stroke Counters described in Catalog 7 Send for your copy today!

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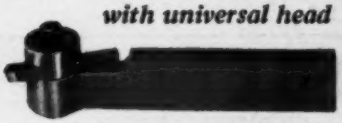
Industrial
Couplings

A coupling by which ends of shafts are permanently bolted to flexible Thermoid Hardy type discs—requires no lubrication—no attention. Authorized dealers in principal cities carry stocks for immediate delivery.

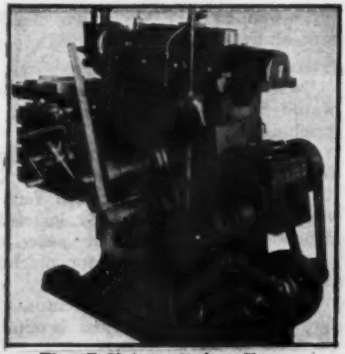
FlexoiD

FlexoiD
Tool Holders
with universal head

No need of right, straight or left hand shank tool holders when using the FlexoiD. Five sizes, 0 to 4. Write for 30-day trial.



"It's all in the Tool"



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Convert your present line shaft driven lathes, shapers, milling machines, etc., into individual motor drives for the utmost in efficiency and economy.

Write or wire collect for information regarding nearest distributor.

THE SMITH POWER TRANSMISSION CO.
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ing failed to fit in the new location, the company refabricated them on the premises. Short of brick and wood, they picked them up at sites where other old buildings were torn down.

The changeover was done in five months. Today the improved layout is saving as much as 23 days productive time on some jobs.

"We Can Do It"

These new plants, of course, are as much a part of the defense picture as the weapons that come out of them—although that fact is generally ignored. Arms cannot be produced in ramshackle factories, in tumbledown sheds or in tents—although, such was our unpreparedness, American industry has frequently done it that way until better equipment could be found. It has, in fact, turned out armament under all sorts of impossible conditions, gladly accepting contracts knowing that it had no room, no machines, no trained men, and coming through ahead of schedule.

THE MIDGET

HALF SIZE

We can supply this Indicator with or without lug on back. Also with support arm for mounting on surface gage. Light weight makes it ideal for use with magnetic base.

Waltham Dial Gage Co
STOW, MASSACHUSETTS

C. A. Tilt, of the Diamond T. Motor Car Company, put the attitude into words:

"If it can be done, we can do it."

Ninety days after he made that statement, Mr. Tilt's company had designed, built and tested a pilot model of a tank transport, provided necessary materials and parts, and subcontracted and arranged for simultaneous production in two plants and was already turning out finished tractors from a new production line. Incidentally a tank transport is a giant tandem-drive, six-wheel Diesel tractor, weighing 27,100 pounds without load or trailer, larger and more powerful than anything of the kind ever built in this country.

Most people would have said that couldn't be done. They would have added that Hudson Motors couldn't put up a 14 building plant with a 1,000,000 square feet of floor space in seven months.

They did!

Ground was broken March 17; first concrete was poured March 26; steel work started April 17; brick work, April 30; first floors were poured May 20 and machines began to come in.

So this country will have Oerlikon anti-aircraft guns.

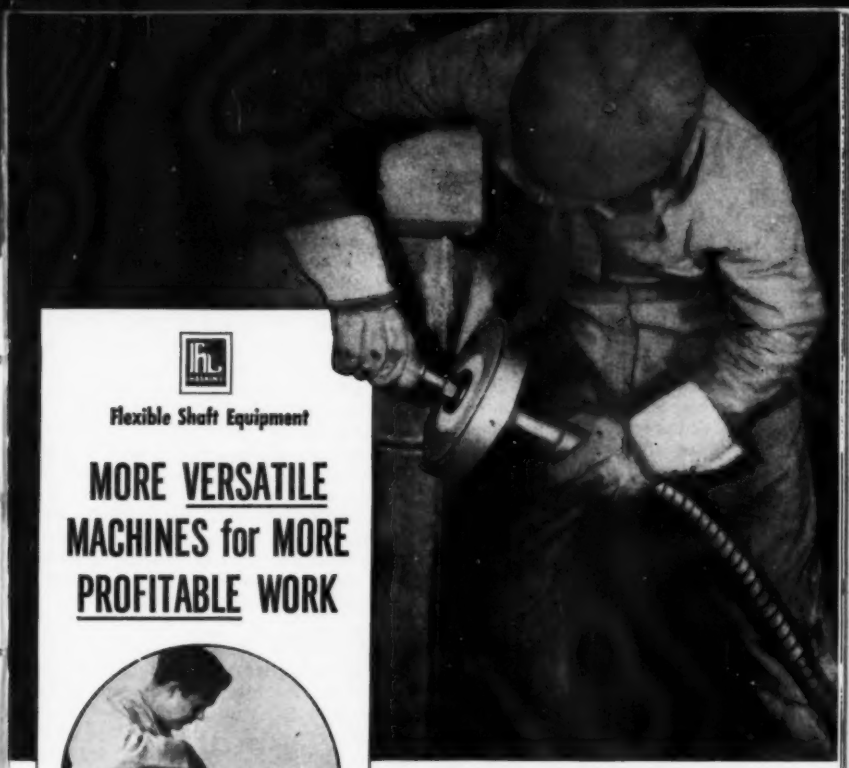
Swords from Plowshares

Even with new buildings, our effort would be pitifully slow except for the machines they house.

On those machines, and the proper use of them, depends our defense effort. That is not a new situation for this country. We have already learned to depend on them for our peace-time standard of living. But for machines, we would have few automobiles, vacuum cleaners, washing machines, radios. They gave us mass production of those things.

Why then can't they give us mass production of war material?

Let O. E. Hunt, Vice President of General Motors, explain it:



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MORE VERSATILE MACHINES for MORE PROFITABLE WORK

Heavy Duty grinding is only *one of many* jobs Haskins Flexible Shaft Equipment will do for you at less cost per man and machine hour. Haskins makes 30 different kinds of equipment—but *each* kind will do *many* kinds of work. See how *you* can apply flexible shaft equipment to more jobs—more profitably. Send for Catalog 45. You'll find it full of valuable information covering grinding, sanding, wire brushing, polishing, rotary filing and drilling operations. R. G. Haskins Company, 623 S. California Avenue, Chicago, Illinois.

HASKINS

Versatile

FLEXIBLE SHAFT EQUIPMENT

Our peace-time design of military equipment has been for small lot manufacture. The American public and American industry have not been war-minded. Industry's equipment has been chosen for the continued mass production of the job in hand, without thought of its conversion to war work, as is common in other nations. Therefore, the equipment of industry is relatively inflexible and unadaptable to this military material designed for small lot manufacture. Different machines must be obtained, different fixtures must be procured, different processing used and, most important, skilled operators must be trained before mass production can start.

To demonstrate what he means, consider armor plate. It's made by slapping 650 pound slabs of steel together like a sandwich and cooking them at 1,600 degrees temperature for a week. Then they have to cool for another week. Since there are 8,000 pounds of armor plate on a 25 ton tank, that means a lot of sandwiches. American Car and Foundry Company undertook to make them. They needed furnaces and a huge new plant which they had to enlarge three times before it was even finished. Once they got into production, they made armor plate that hasn't yet failed to pass the Army's tests.

Or take tank transmissions. They're complicated things weighing almost twice as much as two whole automobiles. Or airplane engines which have some 8,000 parts on one of which—the connecting rod—there are 93 distinct machining operations. There are 25 on an automobile connecting rod. Even motor trucks cannot be inducted into military service "as is" because commercial trucks deliver power only to the rear wheels. The Army wants four or six-wheel drive.

To meet that kind of challenge well and quickly we needed new and rigorously adapted machines. Ordinarily we depend on the machine tool makers for that job. There were some 250 of them in the country. In 1938 they produced about $145,000,000 worth of machine tools. In 1939, they raised the figure to $200,000,000 worth; in 1940, to $450,000,000. This year they are expected to hit $750,000,000. In August alone they turned out $64,000,000 worth, a new high record.

One single company has jumped production from $500,000 to $9,000,000 in two years. To do that they tripled floor space and revamped a plant that was producing candy-making machinery. Now it turns out portable repair kits for the Army's mobile units.

This record explains why the machine tool industry has been almost wholly exempted from criticism in the defense effort. It has done an excellent job; but excellent jobs take time. It takes ten months, for instance, to build a bullet machine. After that it turns out bullets at the rate of 600 an hour. Other machines take even longer—as much as 18 months—and, before the job can be started, the builders have to find out just what types of military equipment are needed, then plan and design the machine tools that will build this equipment.

No Cheering Section

Other industries might reasonably have waited for the machine tool makers to come through with the needed machines. Standing on the sidelines they would have made an encouraging cheering section which the tool makers deserved but haven't had.

They didn't stand there.

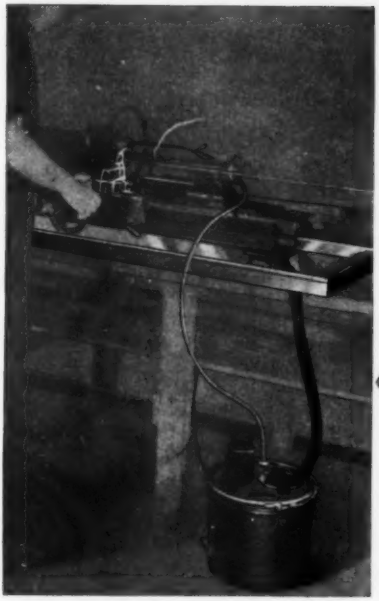
Instead they turned their mechanical know-how and ingenuity to getting the job done with such tools as they had at hand, could assemble off junk piles or rejigger to different uses:

The High Standard Manufacturing Company, target pistol makers of New Haven, prepared to make machine guns. In five months they had a building on what had been a cow pasture, but tools were lacking. Gordon Swebilius, purchasing agent, went looking for them "like a stamp collector hunts rare old stamps."

He toured the country buying second-hand and scrapped machine tools.

GRAY Coolant PUMP

PORTABLE—LOW COST—CONTROLLED FLOW



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Precision Built for Continuous Operation

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PROMPT DELIVERY FOR DEFENSE WORK

Send priority rating with your order.

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INCORPORATED

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Some he took off a dock where they were about to be shipped to Europe; some he found in government arsenals where they had been replaced. At the factory skilled machinists took them over, cleaned them up, scrapped some to get parts for others. Some hadn't been used since the World War. Some were 75 years old.

Today they are producing machine guns two months ahead of schedule.

Turn now to Pottstown, Pa., where the Jacobs Aircraft Engine Co. is making power plants for training planes. Back in June, 1940, they needed special multiple drills that would drill 28 holes at once, turret lathes and an internal grinder.

They were told to wait their turn.

"Wait, nothin'," they said. "We'll build 'em."

They did. A Middle West manufacturer had a stock of drill heads of the simple type used in every-day machine shop work. The Jacobs Company took 200 of them, equipped seven with double bits and mounted them on a single base. That combination drills 14 holes, tolerance one-one-thousandth of an inch. Then compressed air flips the fixture to a new position and the second 14 are bored. Others of the 200 drill heads were adapted to the job that needed the turret lathe, or seemed to.

Revolt of an Appendix

The internal grinder was a stiffer proposition. It was needed to grind the holes in master rods.

"We'll bore 'em," the company decided. Experts assured them that no metal on earth would bore such holes. When the first bit bored two holes and collapsed, the experts nodded and went elsewhere. The Jacobs workers stuck around. Now they drill the holes in seven minutes. Grinding would take five hours.

This wasn't spur-of-the-moment stuff. It was taking 16, 18, and sometimes 20 hours a day. In the midst of it, Donald F. Turner, factory manager, developed the granddaddy of all tummy aches.

"That's appendicitis," doctors said. They recommended an immediate operation.

"Not now," said Turner. For six weeks he continued to spend 16 hours at the plant. Then he went home and strapped ice packs on the sore place.

The appendix didn't crack, but another bottleneck did. That had developed because enamel on cylinders took eight hours to dry in good weather. On wet days it took 15. They hung the cylinders on movable racks and hauled them under infra-red lamps. Now they dry in six minutes.

There ought to be a word to describe that kind of enterprise. Some have called it "productive ability." That's a lack-luster sort of nomenclature unworthy to describe what is perhaps the most dynamic, united effort any nation ever made.

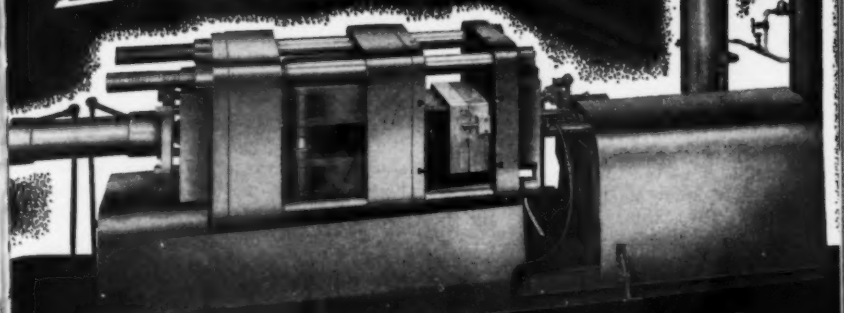
There's drama in it. And excitement! And surprise! Rumpelstiltskin spun a roomful of flax into gold in a single night and demanded the Princess' first-born as a reward. American enterprisers have done more amazing things than that and called them, in the words of the Link-Belt Company, "Just another job." They are looking for efficiency rather than excitement. Baldwin Locomotive Works, making locomotives, Diesel engines, hydraulic machinery, turbines, testing machines and instruments—all basically essential to defense—took on barbettes, tanks, gun tubes, shell forgings, naval gun mounts, as well as a number of products of a confidential nature. When their retooling program had to be curtailed because of priorities, they redesigned and rebuilt old machines. Yet, W. H. Winterrowd, company vice president, reports, "We have had no colorful incidents."

HERE'S A MACHINE THAT

Really **STEPS-UP PRODUCTION**

Improves Quality, and

Reduces Unit Costs...



The HARVILL *Super High Pressure* DIE CASTING MACHINE

for MAGNESIUM, ALUMINUM and COPPER-BASE alloys

Die casting of these alloys was *pioneered* by Harvill—each machine is complete with all accessory equipment that has been *developed* and *proven* in actual service—no costly and time-consuming experimenting is necessary to duplicate the Harvill standards of quality. Send coupon for details.

Actual production records—and the universal acceptance by the exacting aircraft industry of Harvill die castings—are proof that Harvill Super Hi-Pressure die casting machines produce MORE castings per hour of HIGHER quality and at LOWER unit costs. Simple and easy to operate, these *proven* machines, along with years of accumulated experience of the Harvill organization, are now available to other plants that want to help speed defense production.

Your plant can *quickly* be equipped to produce die castings, with Harvill machines—at a surprisingly low cost. Send coupon for new technical bulletin, just published—and get the facts on this method of high speed production.

HARVILL

Aircraft Die Casting Corporation

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HARVILL AIRCRAFT DIE CASTING CORP.

Gentlemen—Please rush to us complete information on Harvill Super Hi-Pressure die casting machines.

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Overcoming problems is just part of the day's work.

Army Ordnance officers brought guns to members of the automobile industry. They were beautiful guns, hand-built by skilled gunsmiths. But hand methods were too slow even if skilled technicians had been available.

"Do you want guns as beautifully finished as these?" "No," the Army men said. "We want efficient guns and a lot of them."

Most of the auto makers had seen machine guns only in gangster movies. But they knew steel, they knew technique. They knew machines. By the way, were there any machines?

There were. They were in store rooms; belt-driven antiquated rattletraps ranging from 21 to 73 years old.

"They're the best we have," the Army said.

The automobile industry cleaned and adjusted them; it reinforced them with machines off its own production line.

Meanwhile a tough old master mechanic was examining the weapons. He had never seen one before but he wasn't impressed:

"Guns? They're just machines, aren't they?"

They were, and American industry knew how to make good machines in a hurry. It wanted to know why bores must be drilled slowly and laboriously with a horizontal drill. No reason. So a special machine was built to drill six barrels at once with gravity and oil under pressure assisting the vertical drills.

Rifling the barrel called for 15 trips of the chiseling tool until production engineers reduced the operations to two, taking one-thirtieth of the former time.

Specifications called for hand-filing of small parts to achieve close fits but the craft of hand-filing has been just about forgotten in automobile plants. It is quicker to machine these parts to small tolerances and then dump them in a tumbling machine — a finishing method borrowed from manufacturers of sewing machine parts.

For the loader mechanism, specifications called for stainless steel which is notoriously hard to machine and getting difficult to obtain.

"Why not use something else?"

"Other steel will rust," said the Army men.

'True," the mechanics replied, "but since when have soldiers allowed guns to rust?"

The Army men grinned.

"You win."

Result, another time saving. So it went with the breech ring; with the shell clips which are now stamped out of sheet steel, a process that saved 5,000,000 pounds of aluminum on the first order; on barrel jackets where punching round holes instead of grinding elliptical ones reduces ten operations to almost nothing.

Technique developed in the manufacture of valve stems was used to make firing pins; rivets, formerly ground one at a time from bar stock, pour out of a header machine at the rate of 180 a minute: side plates; formerly milled singly, are ground out six at a time.

Result: the first consignment of machine guns turned out in automotive factories was shipped to an arsenal eight months ahead of schedule.

THE BARNES

Motor Driven Precision Cutter Grinding Machine

For precision Grinding Formed Milling Cutters used in the manufacture of rifles, pistols, etc.

General Machinery Corp.

140 Federal St., Boston, Mass.

Telephone Liberty 4826

Speed production of small parallel-surface parts *with this* 12" Double-Head GARDNER GRINDER!

15 small coil springs PER MINUTE!

MANY of your small parallel-surface jobs — "hex" nuts, bearing rollers, pins, spacers, gear blanks, fire-arms parts, or coil springs like those illustrated here — can be ground with surprising economies on a Gardner No. 77A—12" Double Spindle Grinder, or a similar tool.

The rotary-carrier method of fixturing, as shown, is exceptionally productive, although several types of purely hand-operated fixtures may also be mounted on one of these machines.

The surfacing of 2 faces at 1 setting, excellent accuracies, and ready adaptability to more than one job, are features which have been responsible for the increased use of GARDNER DOUBLE-HEAD GRINDERS in many industries.

Check the possibilities of this equipment on your own parallel-surface parts—

WRITE FOR FULL DATA ON THIS No. 77A—12" GRINDER!

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

436 East Gardner Street . . . . Beloit, Wisconsin, U.S.A.

Automobile men had no monopoly on this kind of thinking. Having ordered three specialized machine tools for turning down the inside and outside of 81 mm. trench mortar barrels and being promised delivery "Heaven-knows-when," the Pullman-Standard Car Manufacturing Company converted three old engine lathes to do the job and went ahead. This same company makes a small bracket for holding accessories inside the British M3 tank. Ordinarily this would be a job for a forming press, but the company had other things to do with presses. Somebody discovered a pile of parts from junked freight cars. Now the old cylinder from the air brake system, a die fastened to its plunger, is turning out tank parts.

Airplane production has been speeded by the Guerin Process, developed by Douglas Aircraft Company, Inc., by which rubber, under terrific pressure, serves as a die member in hydraulic presses, cutting and forming sheetmetal airplane parts rapidly and efficiently.

From Lockheed came the Triplett & Barton X-Ray machines which speed inspection of airplane parts, and the magnetized bucking bar which simplifies riveting in cramped quarters.

Thompson Products came up with automatic thread grinders, designed and built by Jones & Lamson Machine Co. Adapted to precision operations on exhaust valves, they perform seven operations automatically at one time. Work which used to take 20 minutes is now done in 1½ minutes.

Allis-Chalmers converted an old agricultural and road grading machinery plant, refurbished the old machinery and now makes mounts for anti-aircraft guns. Entering another field, the company observed that, in making turbine blades for the motors of fighting ships, only one end of the cutting tool was used.

They put a stop to that. Now both ends are used, two blades are machined in a single operation and production jumps more than 300 per cent.

This could go on and on: boats are being built upside down, ships are being welded instead of riveted; where rivets are used, a new explosive type speeds blind riveting. Or else "ice box" rivets are used, stuck into place and left to swell tightly in the higher temperature.

Naturally some lines have gone forward faster than others; naturally there have been "bottlenecks," confusion, uncertainty, disappointments. Naturally some production has been pitifully slow —heavy bombers, for instance. Almost everybody asks:

"Why don't we produce planes like we build automobiles?"

Arthur A. Schwartz, of Bell Aircraft Corporation, gives some reasons:

About the only similarities between an airplane and an automobile are that they are both vehicles and are propelled by gasoline motors. Even here, there are dissimilarities because aviation gasoline is quite different from commonly used automobile gasoline.

The automobile owes its popularity to two factors: reliability and cheapness. In engineering the motor car those are of supreme importance. Secondary factors include operation, luxuriousness and performance. Weight is considered only after these others are satisfied.

In airplane design the priority among factors is in the reverse order. Lightness and strength are the two supreme factors.

This difference in values leads to dissimilar methods in automobile and aircraft manufacture. In the auto plant, material is selected with an eye to machinability and cheapness. In the plane

SAVE TIME when 'time is short'

TOOL POST TURRETS FOR ALL LATHE SIZES
Saves on Setting Up — Saves on Repeat Operations
WRITE
C-W-C CORPORATION
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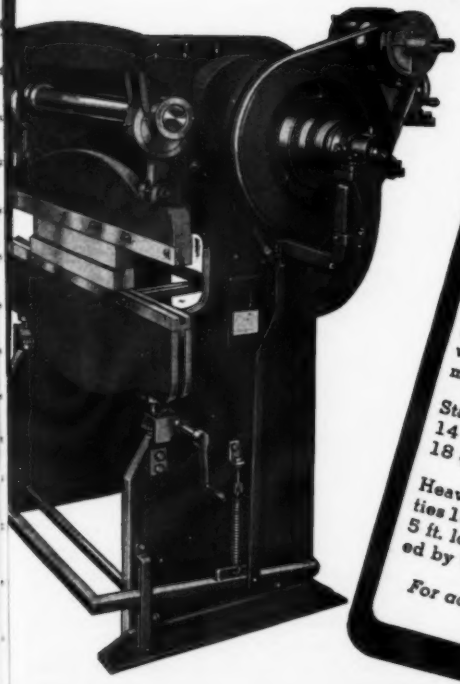
POWERFUL

CHICAGO STEEL PRESS BRAKE



This No. 253 is a POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

This money-saving production tool will handle 40 to 50 percent of the work done in an average shop. Greater speed, higher efficiency—much lower operating cost—plus the highest quality material and sturdy welded construction as in our larger machines.

Standard Series—3 sizes—capacities 14 gage, 4 ft. long; 16 gage, 5 ft. long; 18 gage, 6 ft long.

Heavy Duty Series—3 sizes—capacities 10 gage, 4 ft. long, V die; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by ¾ to 1½ h. p. motors.

For additional information write for catalogs.

REIS & KRUMP MANUFACTURING CO.

140 LOOMIS BLVD., — CHICAGO, ILL.

factory it is selected for strength, durability and light weight. Frequently such materials are harder to machine. In the auto industry models are changed once a year. In airplanes, if the engineering department discovers a method for increasing performance, that change is immediately applied in the production lines.

If Autos Were Like Planes

"Designers are unable to add a piece of metal without utilizing its strength," says Mr. Schwartz. "This often requires redesigning of a dozen or more parts, not only to make room for the added piece, but also to use it as a structural member and thus save some of the added weight."

He adds that an automobile does well if its weight is less than 60 pounds per horsepower. Airplanes have about ten pounds per horsepower.

"If an automobile were built like an airplane," he says, "it would weigh about 300 pounds. It would cost like the devil and probably not be worth a damn."

Delay in building bombers is even more understandable to those who realize that the tooling for the bomber program alone calls for expenditures equal to the cost of the Panama Canal.

But, on the whole, we can take some pride in the fact that 1,854 airplanes were built in August as against 200 a month in 1939; that airplane engine production is up to 4,500 units a month; that, in the first eight months of this year, we turned out 58 ships of 630,000 deadweight tons; and production of the raw materials which go into these weapons—steel, magnesium, brass, copper, aluminum, almost everything, is keeping pace.

These figures will increase rapidily. They would increase more rapidly if war's demands were static. They aren't. Each advance in offense means changes in defense, or vice versa. The eight machine guns of the British Spitfire made the armament of other pursuit planes obsolete. There is constant call for more fire power, ceiling, armor. Designs must constantly be changed and even a small change frequently requires extensive retooling.

And the most peculiar requests come in. The Army wanted a wire weighing only 30 pounds to the mile that would carry a phone conversation after being soaked in water for a week. U. S. Rubber went to work. The wire is now being tested.

All of this means an unending succession of new bridges which industry crosses as it comes to them. In peacetime operations, Cessna Aircraft Company required 24 man hours to shape a laminated spruce wing spar for its T-50 model. It cut that time to 20 minutes with a special jig and a peculiarly shaped track. The rough spar is placed on the jig, a motor driven saw rides around the pattern track and cuts the timber to exact specifications.

Inland Steel Company, without building new furnaces, arbitrarily set production figures for ingots 200,000 net tons ahead on January 1 and upped the figure another 50,000 tons July 1. They are still operating at 100.4 per cent of these inflated capacity figures. Diverting steel from other departments, they have pushed the production of plate — needed for ships, pipe lines, freight cars—to twice the department's estimated capacity of 25,000 tons a month.

Shell Oil Company engineers have perfected a system by which 12 or 13 different products can be passed in continuous movement through the same pipe line.

For every type of problem somebody has bobbed up with an answer. Pullman Standard Company employees turned up 1,500 suggestions to meet defense problems. In six months, 390 of these were adopted. One man alone offered 67. As a result, the company

Night and DAY for 1942

WE PLEDGE the entire resources, facilities and man power of our organization, twenty-four hours of every day to the production of more grinding wheels of the same high quality, in our endeavor to cooperate to the very fullest with all of America's defense plans. This pledge we make sincerely and most wholeheartedly.

BAY STATE
ABRASIVE PRODUCTS CO.
WESTBORO, MASSACHUSETTS

has been able to make trench mortars, shells, howitzer mounts, tanks and airplane parts while still turning out a railroad freight car every four and a half minutes.

Lyon Metal Products, Inc., found itself committed to turning out Army trunks. But, since most of its normal products were going into expanding facilities for other defense plants, it couldn't sidetrack its regular work. It conquered this dilemma by building an Auxiliary Defense Department on "roller skates." Now regular production goes forward until 3:30 each day. Then the Defense Department, complete with its own portable assembly line of roller conveyors and all needed tools, is wheeled in. It turns out 1,600 locker trunks a day.

Equally spectacular advances were made in front offices, planning divisions and research laboratories.

When Diamond T, White and Autocar, traditional competitors for more than 30 years in the commercial field, received orders to make identical vehicles for the military services, they got together, delegated all purchasing and subcontracting to a joint purchasing commission, divided freight charges, balanced inventories and shipments to maintain uniformity of production speed as completely as possible.

Such abandonment of old rivalry in the face of national need is not unusual. Recently the Allegheny Ludlum Steel Corporation patented and put on the market a high speed steel which has one-third less tungsten than more commonly used types. The rearmament effort brought a tremendous need for high speed steel and a shortage of tungsten. The company acted at once announcing that it would give free license for the use of its patented steel with no strings attached.

In passing, we might note that other companies did not let pride prevent them from accepting the offer. Many licenses have been granted.

Elsewhere front offices have been busy coordinating efforts of subcontractors and suppliers. One concern alone cooperates with 296 subcontractors and 41 raw materials firms.

All of this would be little help without the plans and drawings which guide the tool builders and operators. There is little paper in a battleship but the blueprints necessary before the first rivet can be driven would fill a box car. After they are made, these drawings must be transferred to metal or plywood patterns. That calls for tedious and skilled handwork. Eastman Kodak Company stretched that bottleneck with Matte Transfer film which reproduces the drawings on the pattern photographically. In five months this saved one aircraft company $500,000.

Science has contributed elsewhere in equally helpful but unsung ways, providing new materials, finding ways around scarcity. Cotton parachute cord is one development, needful because linen formerly used came mostly from Ireland, Belgium and France. Research provided a new technique which compresses cotton fibers together under pressure. This met that need; saved valuable materials.

Another saving, less spectacular, was made when a General Electric Company worker suggested that strips from which small parts were made be cut seven-thirty-seconds of an inch narrower. That will save six tons of steel a year.

Nothing has been too small to try, as the Lockheed people demonstrated. In an operation in the narrow boom of the P-38 plane it was impossible for a man of ordinary size to get into position to do the work. They hired a midget.

There is no need to labor these demonstrations. Neither should they be ex-

THE *Bridgeport* TURRET MILLING MACHINE

Rigidity and Flexibility Unparalleled Range

The most difficult milling, drilling and boring jobs are easy with the new Bridgeport. Here are a few of the advanced modern features that make such performance possible.

Angular settings in one plane are achieved by turning the hand wheel which controls the keyed overarm. Turret diameter is 15" with 5" overarm.

Column, knee and table construction are rugged with wide ways and taper gibs for accurate and vibrationless operation. Table, knee and saddle locks are located in front for easy accessibility.

Graduated dials are 3¼" in diameter. Anti-friction bearings are used throughout.

Write for full details.

BRIDGEPORT MACHINES, INC.

2 REMER ST. BRIDGEPORT, CONN.

pected to astonish anybody. As an Eastman Kodak official puts it:

American industrial research has a whole peace-time civilization to its credit; so it is not remarkable that some research projects, begun in time of peace, have paid out in defense value. Six or seven years ago the Kodak Research Laboratories began research on a rare-element glass. That research bore fruit in time for the new glass to be incorporated in improved aerial lenses designated for the Government.

Other peace-time developments which have enlisted for the duration include the throat microphone, originally developed for the use of miners. Western Electric Company is making them for pilots of combat planes. The same company developed a pulp insulation for telephone cables.

It saves only three one-thousandths of an inch in the diameter of an insulated wire but that saving makes it possible to pack 4,242 wires into space that used to hold 3,636. This helps eliminate a troublesome bottleneck in the communications defense effort as does the method of using an electrical charge to dry newly made telephone cable. Each reel of cable picks up about seven gallons of moisture in the course of manufacture. Once this was removed by a baking process which required 15 hours. The new process, developed in peace time, takes an hour and a half.

Men who have been so continually persistent in seeking new tasks to perform or better ways of performing old ones are not readily stampeded even when the new task happens to be rearmament. Edward G. Budd, president, the Budd Manufacturing Company, sums it up quickly:

Great developments rarely come into being overnight. They usually linger in the thoughts of men or in laboratories until some opportune moment permits their use. Sometimes that moment never arrives and a great idea may be lost to society or industry. War and other great emergencies supply the big opportunity and then, later, peace-time activities continue to benefit. So, what we hail as the achievements of war production have usually been lying dormant or under slow development for years. They spring suddenly into becoming determining factors of our immediate need.

The use of alloy steel for structural purposes, for instance, becomes a standard rather than an exceptional practice. New methods of heat treatment have advanced from the experimental stage to a point where they are indispensable now and for the future. Precision methods make for an interchangeability which vastly extends our production capacity. Mineral shortages have been circumvented by the ingenuity of the metallurgist in devising new alloys—and often better ones.

This is the American way. It may be slow in starting, but once started gives us a lead over every other country in the world, and in a war of materials rather than men, production wins. Production gains, furthermore, are never wiped off the books as war losses.

Open Door for "Screwballs"

The American way that Mr. Budd mentions has been manifest in a thousand different research establishments, laboratories, proving grounds, suggestion boxes and training schools.

Says Director F. C. Crawford of Thompson Products:

Some time ago we put in a "Director of Screwballs." It is a division of research. That director's job is to interview inventors and get the best things that might apply to our business, give the inventor the patent and enter into a royalty contract with him. We will pay this year large royalties to such inventors who have brought us things that we never would have got ourselves.

In other plants, suggestion boxes testify to the universal thirst for new ideas. Such boxes collect a startling miscellany, ideas for saving sweeping compound tumble out beside recommendations of rebuilding ten-ton presses. But every worker knows that his idea will be examined. If it is used, he gets a bonus. If not, he is told why, even if apparatus must be built to demonstrate its failure.

Perhaps no one knows the part suggestion plans have played in defense, but it has been large. One company where the plan was started in 1921 reports that, when defense contracts came in, workers had a lot to offer about better methods of producing armaments.

"The number of suggestion awards immediately jumped."

One who collected was a building superintendent's clerk who overheard a

Who Uses ROSS Air Control VALVES?

The automotive industry uses them by thousands. The great rubber plants, the large steel mills, the glass and the brass industries, the operators of welding equipment, the metal working industry with its heavy punch and stamping presses—all these and countless other Leaders in Their Fields have come to look upon Ross Valves as standard equipment in their plants.

A company is known by the customers it keeps. Ross keeps its old customers . . . and adds new ones as the years go by.

Bring your air control problems to Ross

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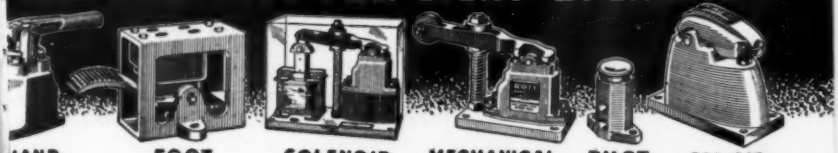
SIZE AND TYPE FOR EVERY OPERATION



HAND CONTROL | FOOT CONTROL | SOLENOID CONTROL | MECHANICAL CONTROL | PILOT CONTROL | ALL AIR CONTROL

conversation regarding the difficulty of milling hard alloy steel. He suggested a new shape of cutting edge on the milling tool. It saved transferring the job to several other machines which would have meant three or four additional operations.

For the General Tire & Rubber Company, a tailor's son, hired to do a particular job, suggested the use of a power cutter for making patterns in multiples. This saving in time, men and money permitted General to clear the decks for further balloon orders.

At Firestone, engineers blush at the mention of Miss Jeanette St. Denis. Firestone has long encouraged suggestions from employees and reports:

> They seem to realize that this project is to provide defense equipment for their own country and things they love most. They are eager to contribute everything possible.

Miss St. Denis was like that. While the engineering department was working out a special device for cutting wire needed in gas masks, she was put to work using makeshift equipment. The next morning she showed up with a wire cutting tool her father had given her. Working in her own way, she cut wire so fast that the complicated machinery was abandoned.

Waclaw Dasziewski, a General Electric boring mill operator, devised a metal yoke that permits one machine to replace three in making bearing rings and self-aligning bearings for battleships.

So ideas gushed in and were adopted. Buildings went up and were filled with machinery, newly built, or reconditioned.

18 Workers Per Soldier

Yet the job was not done. There must be workers to operate the machines. Thousands of them.

Westinghouse is employing 74,000 men today compared to 24,000 a year ago; Curtiss-Wright Corporation has grown from 8,500 to 55,000. expects to employ 100,000 in 1942; The Electric Boat Company has 2,000 today, 380 a year ago. As for shipyards, they employ 375,000 now, will need 125,000 more by next summer, and some of them are working in a plant that made pie plates a few years ago; Bell Aircraft has increased from 1,100 to 11,000, needs 5,000 more; Hamilton Standard, airplane propellor makers, have 4,000 against 1,000 a year ago; Cessna has grown to 3,100, only yesterday it was 300; and Boeing is hunting 21,000 for a plant that, before the defense program started, was farm land.

Finding men in such hordes isn't easy. Moreover, when they were found the job wasn't done. The man who answered a want ad wasn't handed a chisel and told, "Gouge here." He needed training.

Even that didn't stump industry.

Civilian production, too, needs a constant stream of new workers, not so desperately as military production, perhaps, or in such numbers. But the method was at hand—trade schools, apprentice courses, training under experienced men—it had merely to be enlarged.

Mass Production of Skill

Many companies operated their own schools. Winchester's is a good example. Started in 1934, it enrolled young high school graduates from the company's employees, gave them an intensive three-year course and then turned them out as skilled mechanics. Students were paid on an increasing scale as they advanced through the training.

Men so trained became a backbone of the defense effort. Three-year courses were too long in this emergency, but skilled instructors can cram much into a little time.

The skilled men went to work as instructors.

The Wright Aeronautical Corporation moved 300 such men from Paterson, N. J., to Cincinnati, hired all the unem-

ZONE CONTROL IS TRUE CONTROL

Gas Carburizing is accomplished at red heat. The rate of absorbing carbon in the case is very sensitive to the temperature, hence a high degree of temperature uniformity is required. The Hevi Duty Carburizer assures this necessary uniformity by Multiple Zone Control. *Send for Bulletin HD 940.*

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

MILWAUKEE, WISCONSIN

ployed workers they could find in that area and then started vocational training. Out of 12,000 men to be employed, they expect to train between 8,000 and 10,000. And it won't be a snap course. Trainees spend a week at shop arithmetic, science, reading operations sheets and handling measuring tools. If they pass examinations on those subjects they get a crack at machine tools where they work for three weeks under experienced operators.

Surviving that, they are assigned to machines where a veteran operator coaches them for weeks—months sometimes.

That takes time, but it shows results. A jaunt through today's armament plants reveals a jeweler, a church soloist and a former waiter making machine guns; a former milkman operating a vertical board mill; an insurance salesman helping make machine tools; a professional hockey player running a grinding machine; a former Navy cook making shells.

That hasn't been easy. One employer who turned from making women's compacts to shell fuses told an interviewer:

> We turned the whole place into a school. Night after night we'd work till we were all in, knock off for a few hours on a bench or on a desk and then go back and slug away at making the parts right. In spite of it, we wound up three months late in delivering this order—and lost money to boot.

The record shows that, when the first order was finished, the company bid on 4,500,000 more pieces—and completed them three months ahead of schedule.

The training job was made tougher because it was not only green men who needed training. At the Armstrong Cork Company, men who have spent from ten to 50 years making cork products are now making shells. None of them had even seen a shell tooling machine. They are intricate and each shell requires 18 different machine operations. Yet operations began the same day the machines were set up.

At Mergenthaler Linotype Company men are making telescope mounts, range quadrants, artillery spotting boards and various other optical instruments, who, a year ago, did not even know what such things were for. The company sent key men to Frankford Arsenal to learn the craft and teach others.

For the Pennsylvania Fishing Tackle Company and the Ocean City Manufacturing Company, former fishing reel makers are now producing delicate machine parts; The Waltham Watch Company is making taper pins; the Mohawk Carpet Mills are making thermal tubes; Coca-Cola Company is filling powder bags. Defense materials are shaping in hands that used to make cameras, cream separators, postage meters, bakery and cigarette manufacturing equipment.

Even workers in plants like Doehler Die Casting Company, International Harvester, Harrisburg Steel Corporation, and others used to handling heavy materials and machinery, could not swing into defense production overnight.

At the Lakeside Bridge and Steel plant a bystander watched welders at work on a gun mount wellmount—the foundation built into the deck of a battleship to support anti-aircraft guns.

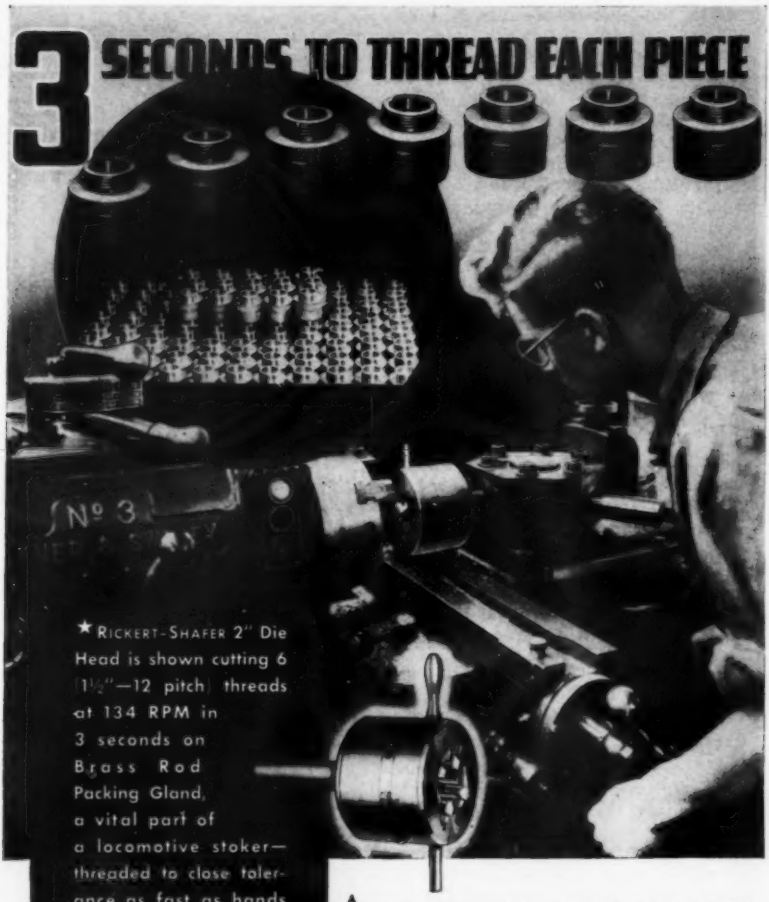
"Is it done?" he asked as the welders stopped.

"They hope so," an official said, "but they won't know until it's tested. That's the toughest sort of a welding job."

Cutler-Hammer, experts in all sorts of civilian power and control systems, undertaking—among a variety of defense jobs—to work on electrical controls for submarines, estimated that it might take six months merely to design the system.

"I helped to build railroad cars in the World War," said a veteran ma-

3 SECONDS TO THREAD EACH PIECE



★ RICKERT-SHAFER 2" Die Head is shown cutting 6 (1½"—12 pitch) threads at 134 RPM in 3 seconds on Brass Rod Packing Gland, a vital part of a locomotive stoker—threaded to close tolerance as fast as hands can feed.

ABOVE is one of scores of close tolerance threading jobs handled with RICKERT-SHAFER Die Heads and Taps for the world's largest builder of locomotive stokers. Write for recommendations. You get better deliveries at RICKERT-SHAFER on Die Heads and Collapsible Taps.

The RICKERT-SHAFER CO., Erie, Pa.

Specialists in ACCURATE THREADING at GUARANTEED LOW COST

chinist, "but tanks are pretty tough sledding. Even the rivets must be armor plated. I had to learn all over again."

At the Electric Boat Company a blacksmith straightens propeller shafts with a monstrous hydraulic press.

"Only about one man in 1,000 can do that kind of work," says a company official. "It requires a keen sense of touch."

Precision is something else. Many American workmen were used to working at tolerances as small as two- or three-one-thousandths of an inch. Thousands were not. But they are learning—learning so well that Garand rifles made by Springfield Armory and by Winchester may be knocked down and the parts scrambled. Guns assembled from the resulting miscellany shoot as well as the originals.

Subcontracting increases the need for precision. If subassemblies from 30 sources are to work together, everybody has to be accurate; and some simple-appearing equipment is amazingly complicated. There are nearly 1,400 parts in a modern airplane propeller, for instance; 74 in a Garand rifle; 11,500 in a bomber's nose alone.

The Hands That Rock the Cradles

While the men have been putting in long hours to demonstrate that democracy can surpass the efficiency of totalitarianism, the women have not been lagging.

Hercules Powder, opening a training school to teach powder bag printing, sewing and loading, enrolled 300 girl students. They will run electric sewing machines in bag assembly operations.

Stewart-Warner has found women far more dextrous than men assembling precision machined parts for artillery shell fuses.

"A woman brings to this job the same skill she uses in crocheting or threading a needle. She does both those things better than a man."

Hundreds of women are assembling fuses for this one company.

They're busy elsewhere, too:

At the Switlik Parachute Company hundreds of women are making and rigging parachutes, ironically using silk now scarce for stockings; at Stearman Aircraft, 47, under a woman foreman, are making airplane wing coverings; at Western Electric they are assembling aerial radios; in a West Coast paper company, many, including three grandmothers, are working on powder bags; while at High Standard one hardy pioneer is operating an enormous drill press efficiently alongside the men.

Dictators may rant that democracy is inefficient, that we have grown too soft for war. They overlook the fact that free Americans have acquired a versatility which they bring to new tasks. They underestimated the adaptability of peace-time training courses to wartime needs.

Performance in that field already demonstrates that, though priorities and shortages of materials may complicate the picture, there will be no shortage of skill to turn materials into arms, even though someone has estimated that mechanical war requires 18 workers to keep one soldier in the field.

Nor has industry limited its training effort to itself alone. As early as 1915 the Sperry Gyroscope Company established an advanced training school which has instructed hundreds of selected men from the Army, Navy, Marine Corps and Coast Guard in the use and maintenance of aeronautical instruments, anti-aircraft directors, and a score of other navigation and range-finding devices.

When the present emergency was declared, the Ford Company suggested that its trade school might be of use in training recruits in the mechanical branches. The offer was accepted De-

ARTER

ARTER ROTARY SURFACE GRINDERS

are meeting the demands of aircraft and automobile engine manufacturers for precision equipment for grinding the sides of gears.

Smooth surfaces must be produced, accurately flat and parallel, with the grinding lines in a concentric pattern.

Made in capacities up to 40 inches.

ARTER GRINDING MACHINE CO.

WORCESTER MASSACHUSETTS

cember 5, 1940. New facilities were required. Ground was broken December 6 and, less than 40 days later, on January 12, the administration building, Barracks "A", mess hall and galley were completed. By April 1, the first class of naval recruits had been graduated and dispatched, available for duties at sea.

Today 1,500 recruits are in Ford training classes, adapting automobile production methods to manufacture of airplane engines. They will graduate at the rate of 630 a month as skilled mechanics, electricians, ship fitters, carpenters and metalsmiths, after 90-day courses. Capacity of the school will eventually be 2,000 students.

While the company is doing this, it is also building bombers, airplane engines, automobiles and blitz buggies for the army.

Westinghouse, in addition to filling more than 3,600 different defense orders, has turned its research laboratories into a real "scientific arsenal."

Cooperating with technicians from the armed services, they have tackled problems and suggestions ranging from a method of protecting battleship instrument panels against the concussion resulting when a broadside is fired, to a scheme—so far impractical—of blasting airplanes out of the sky with rings of air travelling at high speed.

Going great guns, indeed.

All industry is.

Of course, we do not have everything we need. Of course the plant is not complete. Maybe it never will be. American industry believes nothing is ever complete.

An AC spark plug executive was asked when his machine gun plant would reach a point where production methods were pretty much stabilized.

"Hell," he said, "we're been changing things in our spark plug plant almost every day for the past 30 years. When we get to the point where we can't continue to improve our methods or products, we'll stop and let someone else have a try."

Not for Pay Alone

That is the spirit that has gone into defense production. Not only from management's side.

The Hudson Motor Car Company some months ago established a vocational school to train 7,000 men who will eventually be needed in a new plant. Hudson President A. E. Barit speaking:

> Our workers while still handling their usual jobs, are attending this school nights and Sundays in order that they may study the more exacting requirements of gun manufacture. I know of no better example of American resourcefulness and determination and I cannot commend their zeal too highly.

In the face of continued reports of strikes and labor disputes, that is an encouraging note. There are others.

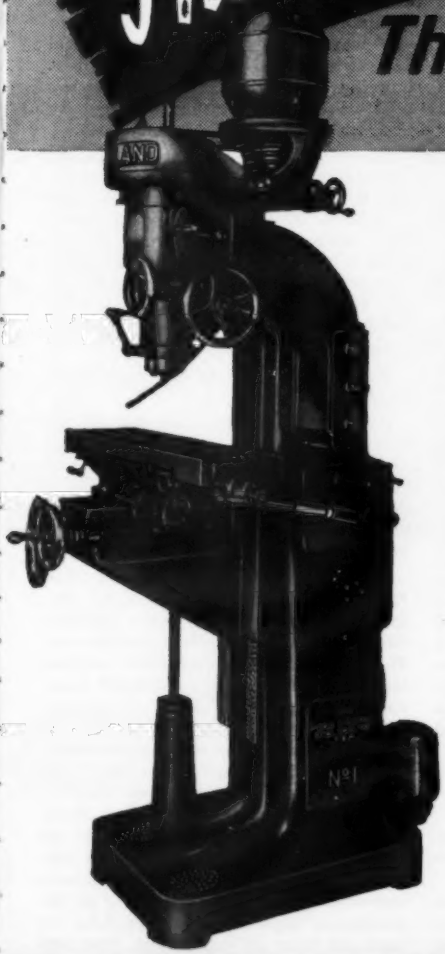
The Doehler Die Casting Co. has an exclusive bargaining agreement with the National Association of Die Casting Workers affiliated with C.I.O.

"The officials of our union have submitted to us a proposition declaring a national emergency to exist," says Charles Pack, company president. "They agree to cooperate with management to the fullest possible extent to aid the national defense program. They suggest a joint management and labor council which will have full authority to set up policies for labor and management that will lay aside any rules and regulations that may be harmful to the national defense program, during the period of the emergency."

From everywhere come stories of men eating lunch at their machines in an effort to get out the last possible ounce of production. Lockheed reports the frequent necessity of sending home men who insist on sticking by their machines even at quitting time; Cessna met the need of the persistent workers

Introducing

The CLEVELAND NO. 1



VERTICAL MILLING MACHINE

Designed to meet the steadily growing demand. This small, rigid, high-speed vertical spindle Milling Machine embodies all essential features required by the modern tool room, die and mold shop, and production plants. In addition, the new CLEVELAND is equally adaptable to heavy duty continuous production.

It is a completely new machine, designed and built with all these requirements in mind, by a company whose principle business for 20 years has been creating special machines for the high production industries.

Longitudinal feed is 18"; cross travel, 8½" and vertical travel, 16". The table has a working surface 8" by 32". Two optional ranges of 12 spindle speeds each are offered, from 100 to 1750 r. p. m. or 200 to 3475 r. p. m.

For further information write for new Bulletin

THE SOMMER AND ADAMS CO.

CLEVELAND, O.

with "Vitamin Wagons," rolling restaurants which bring food to the workers at the job. There, too, the employees have formed their own "home guard." Workers are voluntarily taking military training to act as possible emergency police for defense plants in the area. Two hundred members have contracted to drill 200 hours a year—officers 400—with no reward except the personal satisfaction of "doing their share."

At General Electric a 53-year-old Polish-born worker received a suggestion bonus. He bought defense savings bonds.

"I want to do what I can to help America," he said. "I have an old father in Poland, a sister in Roumania. I have not heard from them for some time. Here I have plenty to eat and good clothes to wear. I can sleep in peace. I like that and am willing to do what I can to keep things that way."

At Firestone a young man sealing inner liners for gas mask cases burned his arm with hot glue. He stayed on the job.

"I'd rather have my arm blistered a little than to have a faulty mask get into the field."

That's why plants are able to work 24 hours a day, seven days a week. That is an important reason why the American soldier, if war must come, will shoot three times as fast as his daddy did in 1918; move as far in 20 minutes as soldiers once moved in a day. That is why there will be bombers and tanks up ahead and deadly fighting planes above. That is why he will be better fed, clothed and supplied than any other soldier ever was anywhere.

It Hasn't Been Perfect

The task of getting him that equipment has brought on quarrels, mistakes, misunderstandings.

In spite of them, the job is being done far faster than seemed possible, far better than has been written here. No story can list all the obstacles encountered by those who struggled for all-out production. An airplane factory, for instance, can expand no further without additional roads by which workers can get to and from the plant; at Baltimore, the Glenn F. Martin Company found a housing shortage in the way, built 600 houses, several apartments. Now the Government is building more. Elsewhere water supplies, public utilities or power have been lacking or inadequate.

No story can reveal the size of the undertaking — forgetting weapons, for the moment, army contracts call for shoe laces, theater tents, aprons, shirts, caps, socks, undershirts, overcoats, fire buckets, mosquito .nets, dispatch cases, blankets, water bags, frying pans, first aid kits, 17,000,000 handkerchiefs, 37,000,000 yards of tent duck, 92,000,000 yards of khaki cloth.

No story can tell all the disappointments.

Above all, no story can tell all the triumphs. A few have been offered as patterns. Thousands of others, equally remarkable, have been passed by. They deserve to be recorded, not for the benefit of the companies, but for the benefit of national morale.

There is a thrill in learning that American industry has already delivered to the Government $10,000,000,000 worth of defense equipment. That is more than had been ordered last March. It represents 5,000,000 man-years of work. Ten plants are making machine guns, compared to two 14 months ago. Thirty-three new munitions plants are built or building and 13 are being expanded. Two plants—a third is building—are loading shells and a year ago shell loading was an art known to only ten men in the country. Steel ingot capacity has been increased by nearly 6,000,000 tons; the aluminum industry is preparing to turn out twice as much as in 1940, and

Announcing...
THE EC 5V VERTIMIL!

1. 90° SWIVEL HEAD
2. 60° TILTING TABLE
3. 28" RAM ADJUSTMENT
4. UP & DOWN SPINDLE POWER FEED
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To Aid You in Defense

● Here's a new universal vertical milling machine, a machine designed to meet the nation's defense needs. The large capacity and great versatility of the E. C. No. 5V makes its use applicable to the nation's arsenals, ship builders, aircraft manufacturers and the machine tool industry.

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WRITE FOR COMPLETE INFORMATION AND PRICE

EKSTROM-CARLSON & CO.

1300 RAILROAD AVE. *Established Since 1904* ROCKFORD, ILL.

by the end of 1942 will approach the goal of 1,500,000,000 pounds—four times 1940 production.

This has been accomplished in spite of the fact that, as industry has got its sights set on one target, another has been suggested. Goals have been made increasingly more difficult—from 600,000,000 to 1,500,000,000 pounds of aluminum within a year, for instance. The size of the defense program has gone up like a balloon, from $5,000,000,000 to $8,000,000,000, to $12,000,000,000 to $21,000,000,000. . . .

Great Britain is spending some $15,000,000,000 a year for war. Hitler is believed to be spending $24,000,000,000. Including $3,674,000,000 of foreign orders, we are going to spend about $66,000,000,000 in about two years. That is three times the value of the country's railroad systems.

Dictators have gambled that parasites like strikes, and bickering and love of profits would suck the strength from every effort at preparedness.

Those parasites have appeared—in headlines they have grown bloated and grotesque. But beyond the spotlight of the headlines, managers have been listening to orders from Washington and saying, "Yes, Bill. Where can I see one?"

Grizzled master mechanics have been saying, "Guns, hell! They're just machines, aren't they?"

And in shops where taking collections has been forbidden, workmen have approached their foremen:

"We want to take up a collection to buy an American flag to hang in here."

In one shop they have 48, one for every state. A former college football player tells about it:

"We just decided we wanted to show our colors and that we fellows here in the foundry were backing Uncle Sam 100 per cent. So we chipped in and bought the flags, and we climbed up and hung them on the rafters. Then we paraded around singing 'America.'"

Being the biggest he had to carry the flag.

"I sort of wanted to," he said.

In another plant production was not going well. The foremen announced that his group would have to work Saturday. An earnest young worker stepped up:

"Ed," he asked, "do you want me to come down tomorrow? Or shall I go ahead and get married?"

Industry is going great guns.

"ALNOR" Velometer

An All Purpose Air Velocity Meter —Instantaneous, Direct Reading.

Measures total and static pressures as well as velocities.

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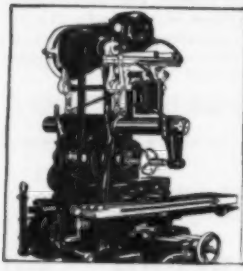

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Remco Drives cut power cost, boost out-put, reduce overhead, save floor space, etc. Unlike ordinary drives, the Remco takes any motor of reasonable size—new or USED. Patented universal motor mounting does the trick. No new machines, nor motors, to buy. Motor switched instantly in case of "burn out." Smaller h.p. motor used. Write! Remco Products Corp., State St. at R. R., York, Pa.

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for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

STOP PAYING HOMAGE TO OBSOLESCENCE

INSTALL Avey DRILLING and TAPPING MACHINES

The extra precision . . . extra quality . . . extra service built into AVEY machines are the very things to wipe out excessive obsolescence penalties along the production line . . . and to meet modern high speed production requirements. Compare AVEY features point for point for a full appreciation of what they mean in lower drilling and tapping costs. Write for illustrated and descriptive literature.

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO

1 Motor-Avey for intensive high speeds. 2 Motor-Avey Multi for regular production. 3 Avey Motor high duty drilling machine. belt driven. 4 Sliding head belt drive No. 2 Avey Drilling Machine. 5 Bench Type Motor-Avey for intensive speeds.

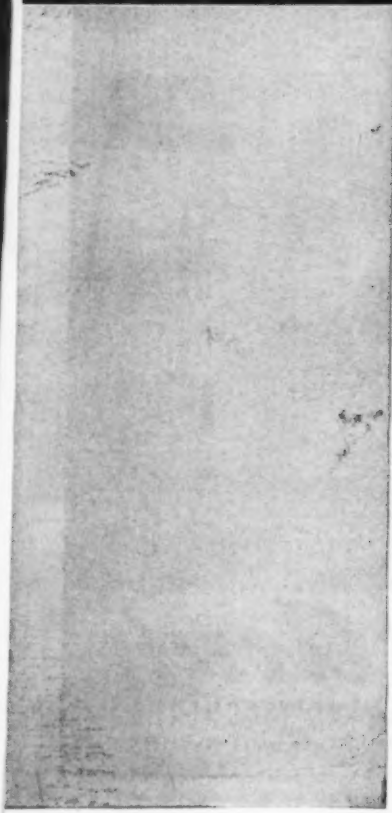
1/4" to .375

Avey

DRILLING MACHINES

BUILT TO DO THE JOB FASTER AND BETTER

JARVIS



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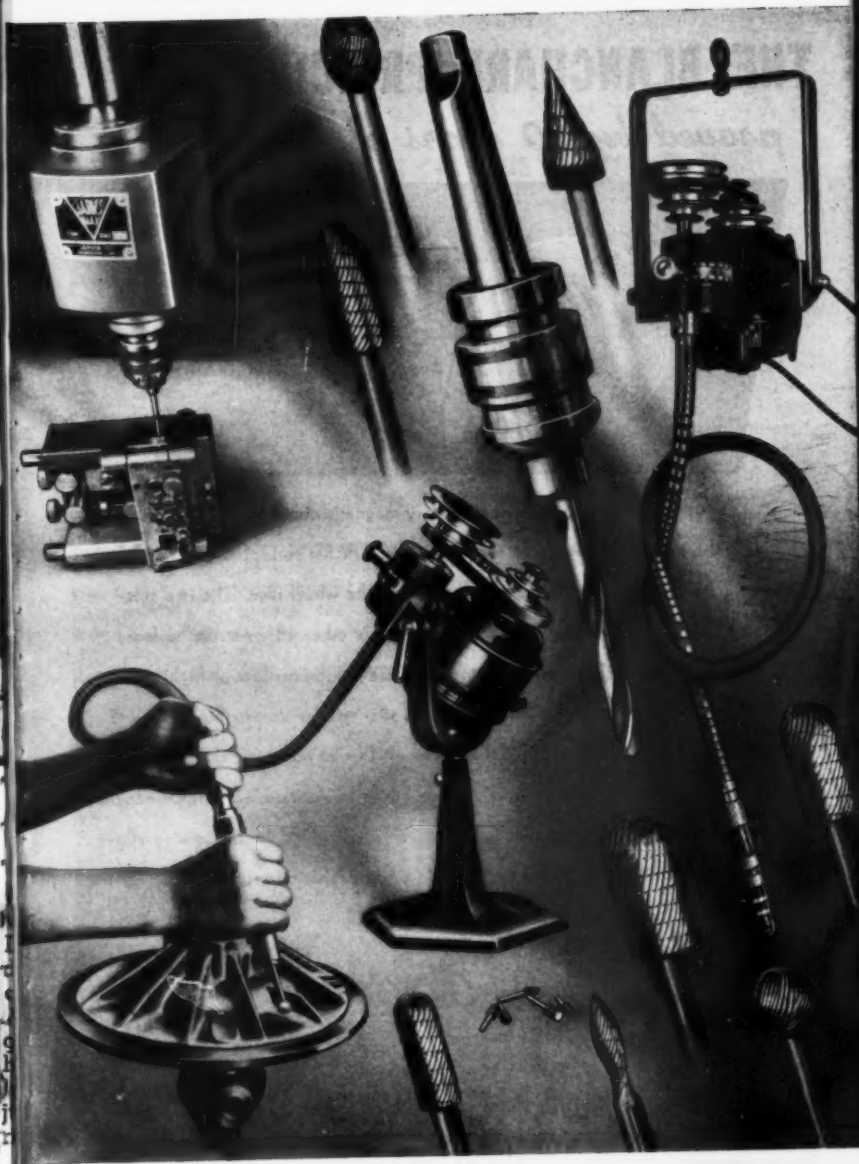
Flexible Shafting

Tapping Attachments

Quick Change Chucks & Collets

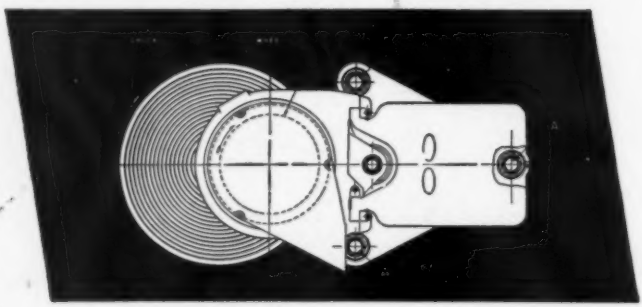
Ground from The Solid Rotary Files



THE CHARLES L. JARVIS COMPANY, MIDDLETOWN, CONN.

THE BLANCHARD PRINCIPLE

proved by 30 years of service



Work carried on the Blanchard rotary magnetic chuck is ground with the end of a cylinder or segment wheel. A flat surface is generated on the work regardless of the shape of the wheel face. The two sets of curved grinding marks, crossing each other all over the surface, serve as a check on the flatness. There can be no low or high spots in such a surface. One test with a straightedge across the center will check the alignment of the machine. This correct parallel alignment of the axes of wheel and work is easily maintained with the Blanchard Three Point Column Support, indicated at "A" in the drawing above. This means of adjusting spindle alignment has been proved dependable and convenient by thirty years of use.

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Flame Hardening and Flame Cutting

By FRANCIS A. WESTBROOK, M.E.

THE advantages of flame-hardening steel parts and products are largely due to the fact that, with this simple process of heating and quenching, it is possible to produce a hard wearing surface and yet have a core which is ductile and shock-resistant. With this method it is possible to harden parts, such as gear teeth, in exactly the places where hardness is required and accurate control is not diffficult to maintain. It is also possible to harden the ways or wearing surfaces of large machine parts such as lathe beds, which would be impossible to harden in any other way, or for which any any other method would be unduly expensive. Furthermore, as the rate of heating with the oxy-acetylene flame is fast, it is possible to harden the surfaces of steel sections as thin as ⅜" without changing the properties of the interior. A depth of hardness of from 1/16 to ¼" can be uniformly controlled because the rate of heating and quenching can easily be controlled with accuracy.

Fig. 1—Here's about the only practicable method of hardening wobbler pads on a 9-ton spindle.

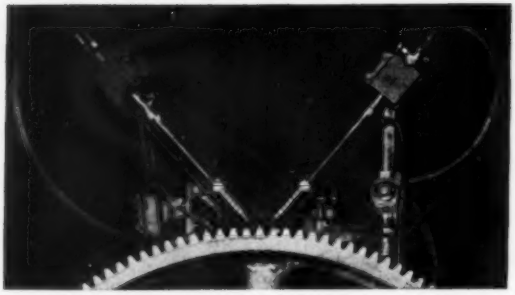

Fig. 2—Equipment for Flame Hardening a large spur gear at the rate of one tooth per minute

The flexibility of flame-hardening is illustrated by the fact that the process is successfully applied to such varying items as pump liners, machine-tool ways, crane wheels, gears, tractor shoes, crankshafts, cam shafts and many other parts. Flexibility is also greatly enchanced by the portability of the flame-hardening equipment, which is light and simple to set up where wanted.

Plain or alloy cast iron and malleable iron, as well as any steel susceptible of hardening by heating and quenching, including low-alloy steel, can be hardened by the flame process. Steels having more than 0.7 per cent carbon call for special care to prevent surface cracking and the high-alloy steels call for special consideration. The equipment manufacturers will give details on flame hardening various types of steels.

The possibilities of flame-hardening are not affected by the size or shape of the part to be treated. Of course there are limitations, as with any other process, as when a large number of small parts are to be case hardened. Then it may be more economical to handle them in quantity according to well-established methods. A diversity of practical and successful applications are shown in Figs. 1 to 5.

Except in some occasional instances, it is generally highly desirable to carry on flame-hardening operations by mechanical means. Otherwise it is extremely difficult, if not impossible, to obtain uniform results. As a general rule, existing equipment in the shop is easily adaptable — a lathe, for instance, which can be used for both flat and round pieces, with the blowpipe

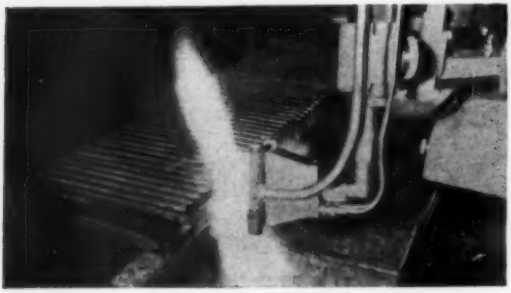

Fig. 3 — A 30-flame heating head for hardening pipe wrenches on a quantity production basis. Water nozzles are attached directly to head.

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mounted on the tool carrier and the work on or alongside the lathe. Both the flame and the work may remain stationary, or either the work or the flame may move as the job progresses, as when hardening the flat surface of machine-tool ways. For such plane surfaces the blowpipe should be fitted with a head giving enough flame area to cover the portion to be hardened, and be made to travel at the maximum speed which will permit of heating to the proper temperature. This speed will vary from about 4 to 10" per minute, depending on the intensity of the flame, the type of steel and the depth of hardness desired. A stream of water, or spray follows immediately behind the flame to quench the heated surface.

Where the hardening is to be in a circular path, the work is turned in a lathe while one or more stationary blowpipes with the water-quenching attachment operate on the surface to be hardened. The usual speed of rotation is about 100 r. p. m., and the time required for this spinning method of flame-hardening will vary from a few seconds to a minute, depending on such factors as the number of blowpipes used and the diameter of the pieces. This is the method used, for example, for hardening the teeth of small gears and pinions having small teeth, as well as for hardening local areas of shafts.

A whole shaft, or linear portion of one, is flame-hardened by spinning it in the lathe while the tool carrier with the blowpipe traverses it. The oxy-acetylene apparatus must be water-cooled and, on account of the need of hardening various widths in different operations, it is necessary to have tips of the removable, threaded type so that the proper one for each job may be selected and used. Heads for different operations are available or can be designed. The same is true of the nozzles of jets used

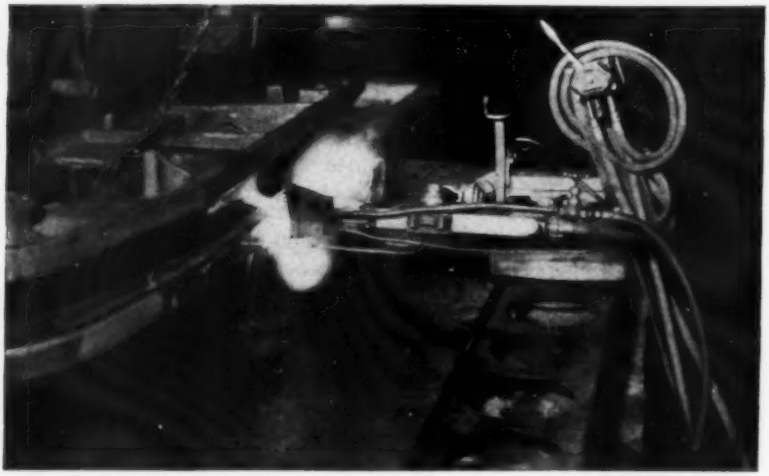

Fig. 4—Application of Flame Hardening to irregular surfaces of cast steel chain conveyor rails.

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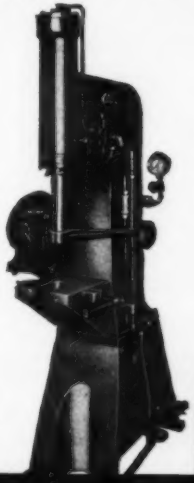
Above: The No. 5S Press of 12 Tons capacity. The combination of Greenerd gearing and Timken bearings makes it possible to obtain 12 tons pressure with little effort. Receives diameters up to26 inches. Largest mandrel, 4 inches. Maximum height over plate, 30 inches.

Below: The 6 Ton Greenerd Hydraulic Press No. H-57 is self-contained, with pressure control from ½ to 6 tons on the down stroke. Stroke of ram is adjustable from one to 16 inches. Working table 10"x10" with 2⅜" cored slot.



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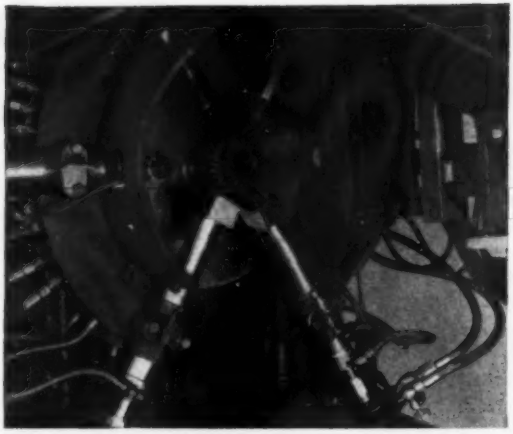

Fig. 5—The Fellows Flame Hardener — an automatic time-controlled machine for heating parts to be locally hardened. Based on "spinning" or work rotating, uniform heat distribution, controlled depth of heating, controlled time and minimum distortion are among advantages claimed.

for applying the quenching water.

After hardening, and within half an hour, the work should be followed by a stress-relieving draw at a temperature of from 300 to 400° F. This will prevent checking and minimize distortion without affecting the hardness. Cooling in still air is satisfactory.

Small Portable Flame-Cutting Machines

The use of small, portable flame-cutting machines provides advantages to machinery and equipment manufacturers, and others, which are practically unlimited. The almost infinite variety of applications of these tools for the speedy, accurate and economical fabrication of steel are such that a brief review of some of the accomplishments with them is decidedly timely in these days where increased production is so important.

Portable cutting machines are extremely versatile and can be used for cutting straight lines, circles, bevels, and irregular shapes. Moreover, these

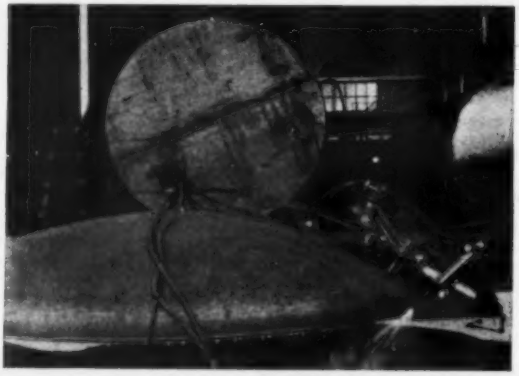

Fig. 6—Flame Cutting flange from a 14-ft. dome top for a tank. A radius rod provides for travel of cutting torch in a perfect circle.

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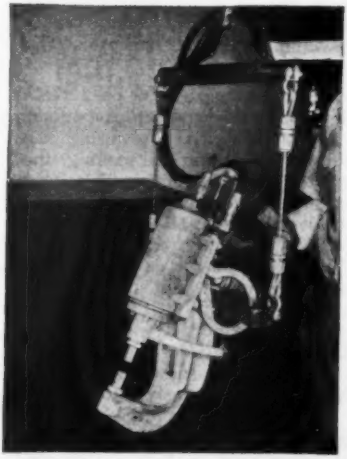

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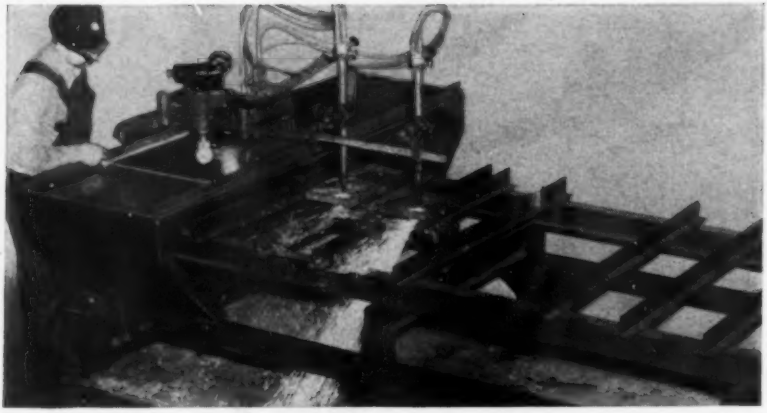

Fig. 7—Cutting table provided by a machinery manufacturer so that parts might be cut out of heavy plate without moving stock between cuts.

machines are small enough to be brought to the work whenever it is economical to do so. Little time is required for set-up. With such cutting equipment it is merely necesary to take material from stock, cut it to shape and weld it into whatever structure is required. Where shops are producing similar products in quantity, fixtures can be made easily for speeding up the work and insuring the necessary close uniformity of the parts.

A good example of the use of a fixture is found in a shop having to bevel a large amount of plate. A frame was made for the cutting machine to run on, making it possible to position the plate quickly against a stop. The machine can be as quickly removed after the bevel has been cut. This operation was formerly done by hand and was decidedly more costly in time and money.

An example of the uniform accuracy with which work can be performed with the portable cutting machine is found in the fabrication by a manufacturer of a 42" diameter rotary for a snow plough. It was formerly cut by hand and machined to obtain the necessary smoothness and balance. By using the portable flame-cutting machine it was found practicable to eliminate the need for machining the outside circumference, thus saving worth-while time and expense. The stock used is ⅜" plate.

Savings in material have been realized by a concern manufacturing trucks with a 4-wheel drive by using the flame cutting machine in making the front-wheel ring clamps. This ring has an outside diameter of 8 ½" and an inside diameter of 6 ⅜" and is cut from 2" plate, the cost being $1.68 for labor and materials. This was formerly a forging and the cost was $2.24, due, in part, to the fact that with the old method it was necessary to machine the outside of the forging. Such machining is now unnecessary. In addition to this, the portion of the ring cut from the center is used to make the front-wheel bearing cap, a saving amounting to $0.80. This example illustrates how material is saved because it is possible to cut directly to the edge of the material, plate or slab,

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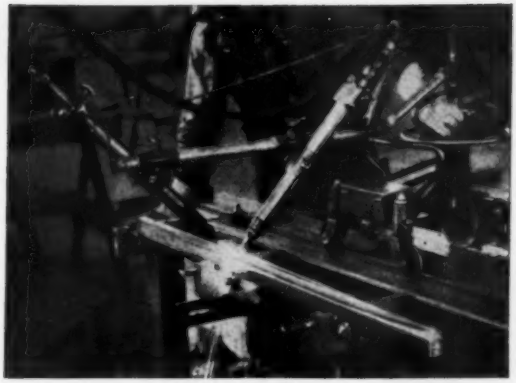

Fig. 8—Using a small portable Flame Cutting machine for fabrication. The job includes double-beveling 1"x2" bar stock, which after the beveling is bent into a semi-circle.

and to use cut off pieces which in many instances otherwise would be pure waste.

Flame-cutting fits in well with the welded fabrication of many types of equipment because the proper shapes and edges can be made in the one cutting operation with the portable cutting machine.

Several illustrations are included which show various operations with the portable flame-cutting machine. These call for a brief discussion in the interest of clarity. The variety of applications will indicate the versatility of this type of equipment, which actually is limited by little else than the ingenuity of the operator. Fig. 6 shows how a flange is being trimmed from a 14-ft. diameter dome top for a tank. A radius rod was made and anchored by a pin through the center of the top which provided for the travel of the cutting machine in a perfect circle. This was a great improvement over the former method of cutting by hand with the blowpipe stationary and the dome rotated. With this former method, it was practically impossible to control the speed of the dome accurately and the cut was not satisfactory.

With the portable cutting machine, special equipment was used so that the dome could be cut in segments which were convex. Two rear wheels were made so that the machine could be guided by a ⅝" bar which was bent to the curvature of the segment. It was then possible to guide the machine over the contour in the same way as is done when cutting a straight line with an angle iron track.

Fig. 7 shows a cutting table made by a machinery manufacturer so that parts could be cut out of large plate without moving the latter between cuts. The cutting machine is placed on a carriage straddling the cutting bed and travels on tracks 15" long. With this arrangement it is practicable to cut

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plate 60 by 144" in size, the auxiliary lower carriage being manually propelled.

Fig. 8 shows how a small, portable flame-cutting machine is used for welded fabrication. Here the job consists of double-beveling 1" by 2" bar stock which, after the beveling operation, is bent in a semicircle. The bar is tightly clamped during the cutting operation to prevent distortion due to the heat. Two of these semicircles are combined to make one side of the flange of a brake-drum rim flange.

Other applications of the cutting machine in machine shops include such items as cutting die blocks, cams, spiders, heavy wrenches, jigs, fixtures and blanks for large gears. In the manufacture of machinery this equipment is being successfully used for cutting bases and sides for heavy machines, production cutting and beveling shapes for pumps and compressors, etc. Plates, gussets and flanges for traveling cranes are also cut in this manner, as well as tractor parts and parts for pump thrust bearings, circular and rectangular openings in side plates for bottle-washing machines; and various shapes for dough-mixing machinery. This list could be multiplied almost indefinitely and is not intended to be anything more than indicative of the wide variety of possible applications.

From this discussion, brief as it is, it is apparent that great savings in time and money are possible in so many instances that there are few metal-working shops which can afford to be without flame-hardening and cutting equipment of up-to-date design. The manufacturer of such products should give careful consideration as to whether he may not profit by the use of these modern methods.

(Pictures Courtesy the Linde Air Products Co., New York, and Fellows Gear Shaper Co., Springfield, Vt.)

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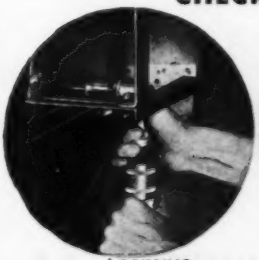

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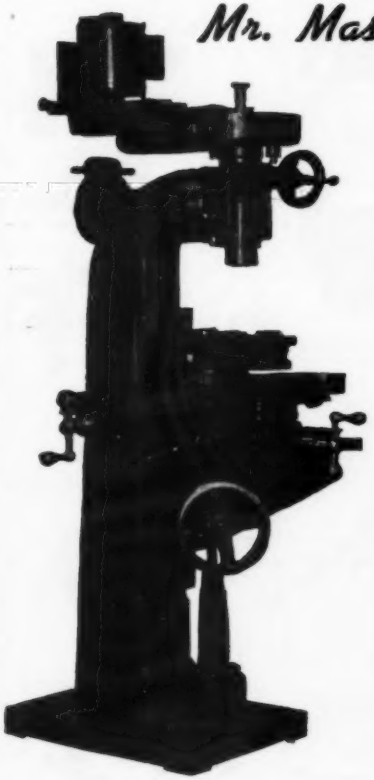

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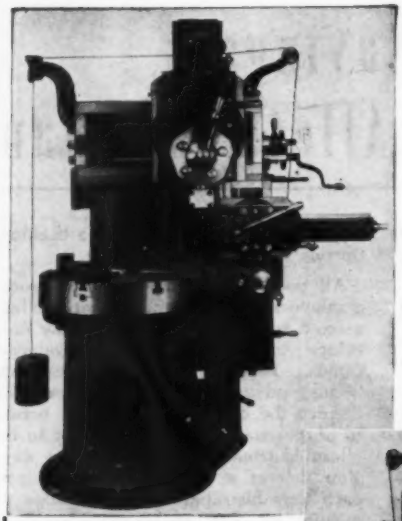

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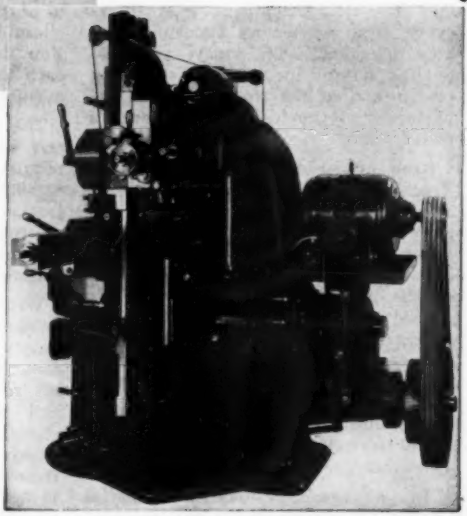

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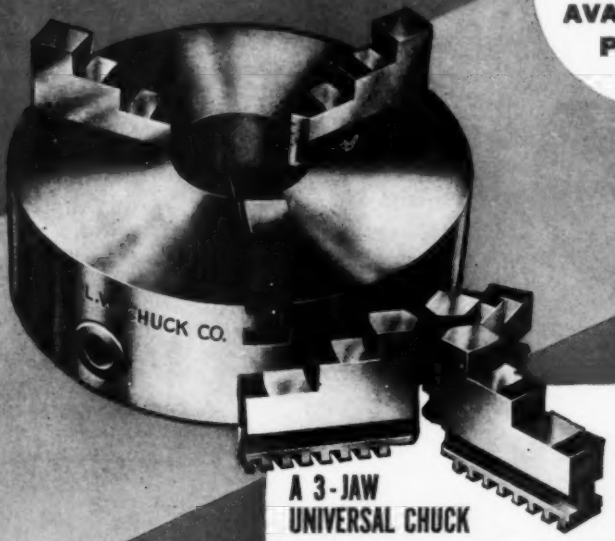

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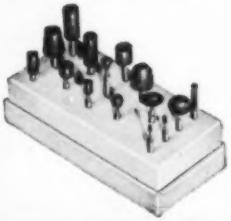

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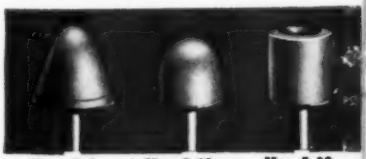

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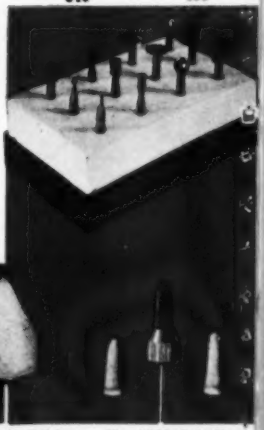

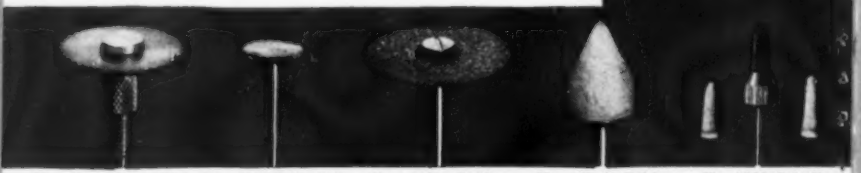

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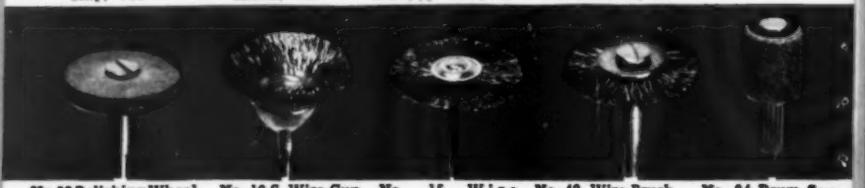

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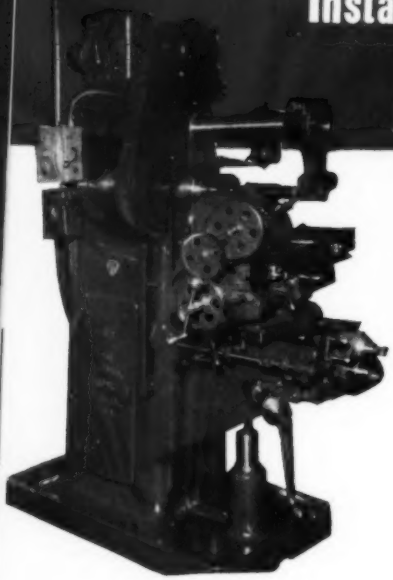

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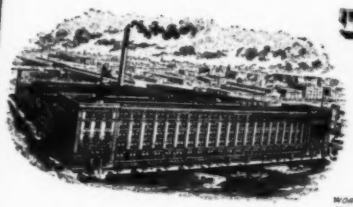

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Mr. Haskell

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Wire Retainers and Snap Rings

By H. F. WILLIAMS

WIRE in either round, square or rectangular section is used extensively for securing mechanisms and devices in all phases of industry. From early childhood most men have used this means of locking or retaining parts of various forms of mechanical contrivances. To the recollection of the average boy grown to manhood comes the thought of bent nails to hold on the wheels of his homemade wagon. Probably to most of us this was the forerunner of the cotter pin, which is nothing more than a retainer made of wire. Although there are many uses for "baling wire" as used to lock hexagonal screw heads when assembled in multiplicity, this article will deal only with the stiffer or spring type varieties.

Because of its higher stress factors, greater strength and comparative ease of fabrication and manipulation, music wire should be used when possible for such locking devices as require round wire. This wire is obtainable from small diameters up to and greater than 0.200" diameter. It is used in the "natural" manufactured condition. No tempering or other form of heat treating is necesary before or after forming. It should not be concluded however, that ordinary black carbon spring steel wire cannot, or is not used in many instances. Sometimes music wire is not available. In fact, for square and rectangular sections any carbon or chrome vanadium wire that can be heat treated to a spring temper will suffice.

In Fig. 1, the collar is held axially on the shaft with a slotted dog-pointed set screw. A groove is turned in the periphery of the collar to accommodate the round wire snap ring. The screw is positioned when assembled to have the slot line up with the groove. The

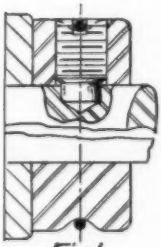

Fig.1

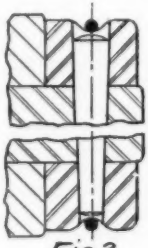

Fig.2

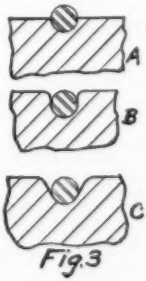

Fig.3

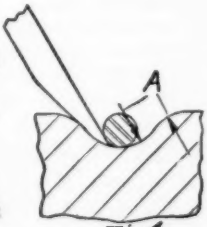

Fig.4

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ring then prevents the screw from backing out.

The method in Fig. 2 is similar to Fig. 1 except that the holding medium is a taper pin. It can be seen that the pin must be somewhat shorter than the outside diameter of the collar groove. Also that the pin hole must be reamed so that the pin will be equi-distant below the peripheral surface of the collar. Because a taper pin has a sticking taper, such an application is not necessary on an external job. It has been used in internal installations such as gear boxes when it was imperative that such a safety feature would prevent the pin from falling out even though it worked loose.

This same method can also be applied to a straight pin, whether the pin is driven in when assembling or has some other type of fit. Because of ease of assembling, sometimes a straight pin has a neat or sliding fit, yet must be retained. Such a spring ring will then be found useful.

The shape of groove in which the round section snap ring rests is of importance especially when the arrangement is to be taken apart. In Fig. 3 at A, the groove is semi-circular the same size as the wire. At B the groove has a depth equal to the wire diameter, both edges of which are rounded slightly. The groove at C also has a depth equivalent to the wire diameter but the sides are tapered and edges rounded.

In the three examples, especially if these grooves are in the external periphery of a part, it will be found that disassembly is difficult, because of these groove shapes. The one at C is better than the other two, but is not so convenient as that shown in Fig. 4.

Here the external groove is made in such a manner that a wedged instrument can be accommodated when taking the snap ring off. When the ring is expanded by prying, it slides up the radiused incline from where it can be

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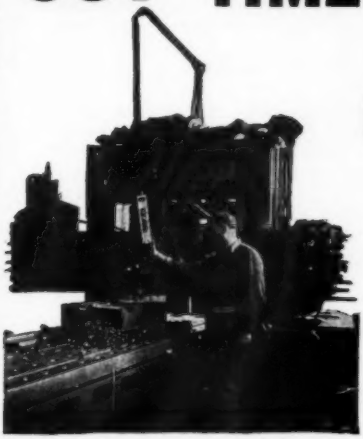

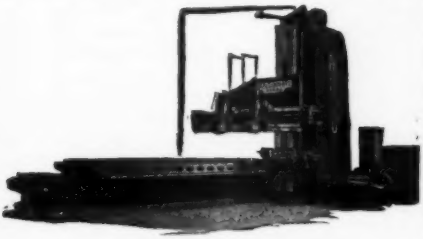

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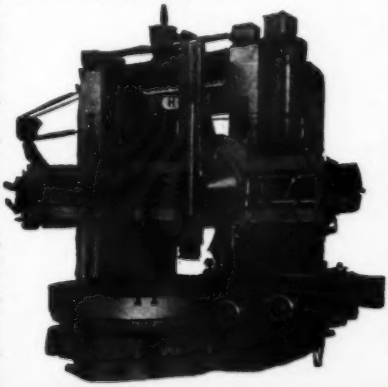

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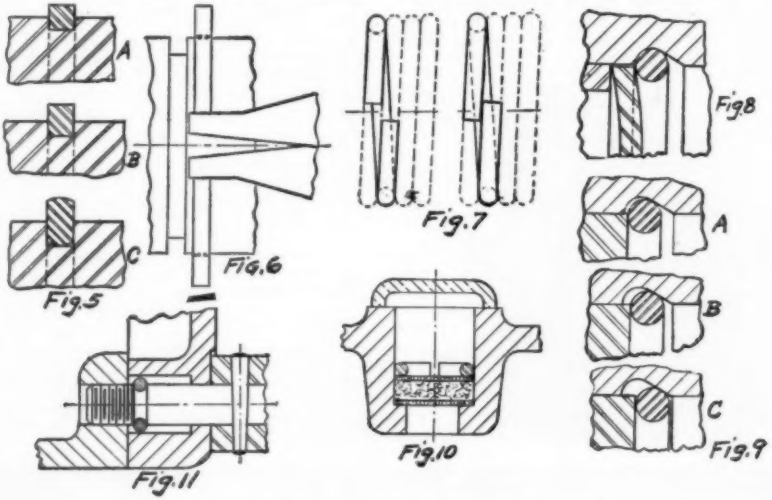
slid out of engagement. It has been found that the radii A should be slightly larger than the diameter of wire used.

An enlarged groove cannot be tolerated when square, rectangular, or rounded rectangular cross section wire is used. In Fig. 5, grooves for these three sections are shown in which the groove depth is usually one half the height of the wire. These types are usually applicable to designs requiring a square shoulder. If the end thrust load is not great, square wire as shown at 5-A can be used. For greater face contact either 5-B or 5-C can be used, the method shown in 5-C requiring a slightly deeper groove than 5-B.

All three designs require a special tool for assembling or disassembling the rings, especially if the inherent stiffness is too great to spread the ring with a screw driver. Such a tool is shown in Fig. 6. It is a special plier in which the jaws engaging the ring ends spread as shown. If the space between the two ends of the ring is small, the ends of the pliers must be thinned accordingly. Later in this article, various designs of square and rectangular wire applications will be shown and discussed.

Probably the easiest way to make snap rings of round wire, especially if used in quantity, is to wind them continuously, like a compression spring, coil on coil. This is shown in Fig. 7. On the left is shown the method of snipping off the coil when the ring is to be used internally. The space between the ends must be wide enough so the coil can be reduced sufficiently in diameter to be assembled. On the right is shown a method of cutting off the coils when used for external application. The ends lap past one another so they may nearly touch when expanded enough to hug the accommodating groove in the held member.

In Fig. 8, the snap ring is assembled into an internal groove and holds a Welch plug in place. One side of the groove is turned out on a 30° angle so that a prying tool can be inserted when the assembly is to be taken apart. The other side of the groove is made semi-



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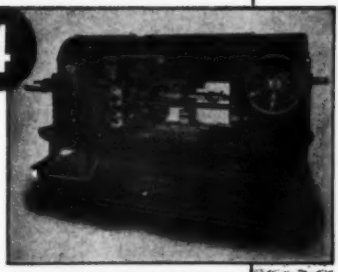
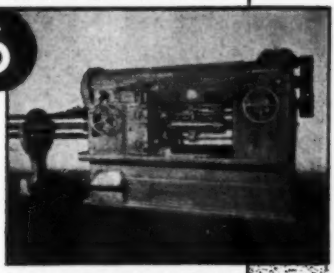
ECONOMY

4



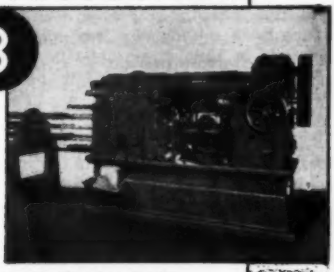
ACCURACY

6



PRODUCTION

8



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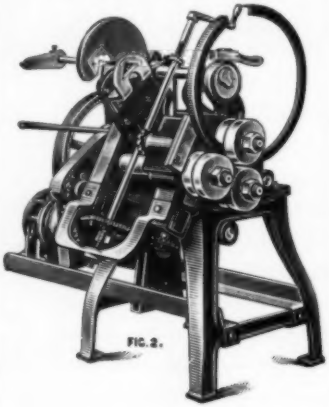

FIG. 2.

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circular in shape and the depth is made half the diameter of the wire.

The groove in Fig. 9 is made the same as that in Fig. 8. At A is shown the position that the snap ring assumes when the retained member protrudes slightly past the left hand side of the groove. The ring exerts a pressure toward the left, keeping the held piece firmly in place. At B, the held member is slightly longer, so the ring assumes a position farther down the incline of the groove. As shown at C, the retained piece is still longer, but the ring yet has a bearing along the angular side of the groove. In this manner, the retained member may be designed with a plus and minus tolerance on its length starting with position B and working in either direction as at A and C. Therefore this type of groove assures one positive position of the ring as shown in Fig. 8 and a series of positions for the ring as in Fig. 9 A, B and C.

Sometimes it is not necessary to provide a groove in which the snap ring fits as illustrated in Fig. 10. This sketch shows an oil filling hole or well built integrally into a gear-box casting. Into the counterbored hole is inserted a round piece of fine mesh wire screen. On top of this screen is placed a round piece of felt, slightly larger than the counterbored hole so as to hug the side wall of the hole neatly. After this another piece of fine mesh screen is put in. The three pieces are held in place by a round snap ring made large enough so that it must be compressed slightly when forcing it into place. It will be found that such an assembly makes a very efficient oil strainer and at the same time eliminates the necessity of cutting a thread for a screw plug. While it is not required, this design has a hinged bronze cover to keep out dust and is used so that cleaning will not have to be so frequent. If the ring is made with but enough tension to hug the hole wall properly, it

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can be removed easily by inserting a screw driver in the slot between the two ends and twisted with an upward pull.

In Fig. 11 a groove is turned at the upper end of the thread on the screw which holds a cover in place. The snap ring is placed in this groove and rides freely in the counterbored hole in the cover. A handle is then pinned to the upper end of the screw. When the screw is withdrawn from the case, the ring retains the screw in place and prevents the screw from becoming misplaced.

Another method is shown in Fig. 12 in which the ring is screwed along the thread of the screw to its proper place. The size of wire used depends on the pitch of the screw and need be but slightly above the outside diameter of the screw. This is shown in the enlarged view in Fig. 13. The ring should be made with sufficient tension to hug the sides of the thread firmly so that it will stay where desired. The counterbored hole in the cover is machined just deeply enough so that when the screw is fully disengaged, the ring bears against the bottom of the counterbored hole.

In Fig. 14 the free rotating machine handle is retained on the spindle with a snap ring. The spindle is machined with a flange into which is turned a half round groove. This groove is deep enough to accommodate the ring when it is compressed to a diameter the same as the outside diameter of the spindle flange. The spindle is first screwed into the handwheel against the face of the flange. The handle is then pushed over the spindle until the bellmouth opening contacts the retaining ring. Pressure against the end of the handle causes the bellmouthed end to compress

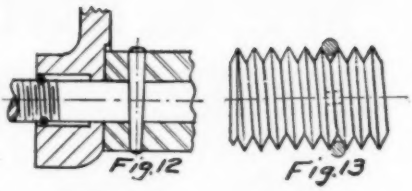
Fig. 12

Fig. 13

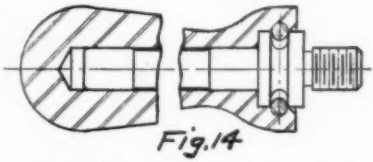
Fig. 14

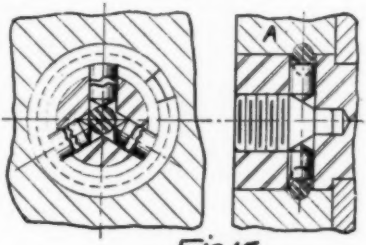

Fig 15.

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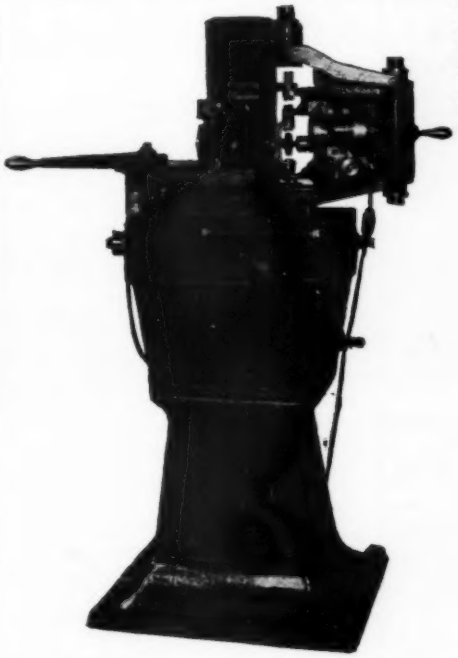

Constructed with Timken Bearings throughout. Driving arrangement and motor enclosed in housing 55" high, with floor space 24" by 48".

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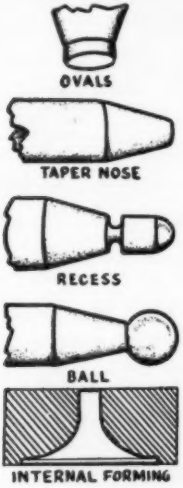

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Machine will reproduce to a very close accuracy.

Will reproduce from any master locked in machine.

Will handle many shapes, including ovals, flats, bulls, tapers, grooves and internal forming. *Write for particulars.*

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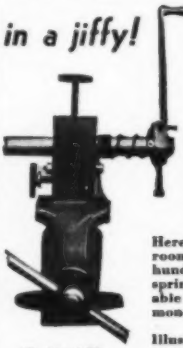

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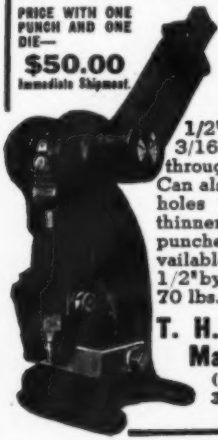

Capacity — 1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16 to 1/2" by 64ths. Weight, 70 lbs.

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the ring into the spindle groove so that when both grooves line up, the ring will snap outward into the groove in the handle. Although the illustration is distorted by the presence of a large diameter wire ring, the handle can be removed readily when necessary if a smaller size wire snap ring is provided. The spindle is relieved in the central portion to give a bearing at both ends. This relief may be packed with grease which will last a considerable length of time.

The retainer ring in Fig. 15 is really a snap ring but one of the expansion type. This design will be found useful where member A must be frequently disassembled. The ring, made of spring steel, fits into and is slightly smaller than the central part. As shown in the end view to the left, three pins bear against the inside diameter of the ring. A special dog pointed screw is turned taper, against which the lower ends of the three pins bear. As the screw is inserted, the pins ride outward, thereby expanding the ring and forcing it into the internal groove in member A. The end view is a composite view in which the pointed ends of the pins are shown when the ring is in the loose position, while the outer ends are shown pressing against the ring in the locked position.

In the second part of this article, which will appear in an early issue, more designs of round wire retainers will be discussed. Numerous examples will be illustrated of the use of square and rectangular wire snap rings. Also various types of wire locking devices in special forms will be shown.

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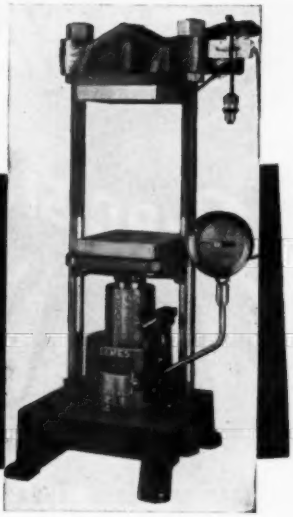

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Also request circulars descriptive of our Jefferson Tail-Stock Turret, Tool-Post Turret, Endless Belt Sander, Swing Frame Grinder and Foundry Riddle.

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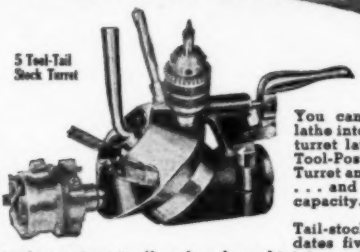

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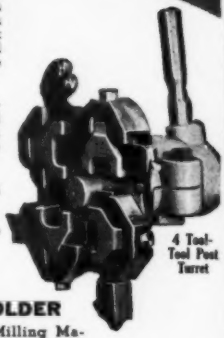

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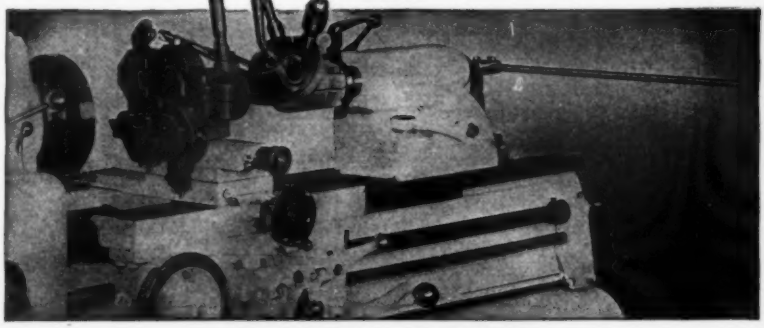

Photo of Jefferson Turrets on 16" Lathe.

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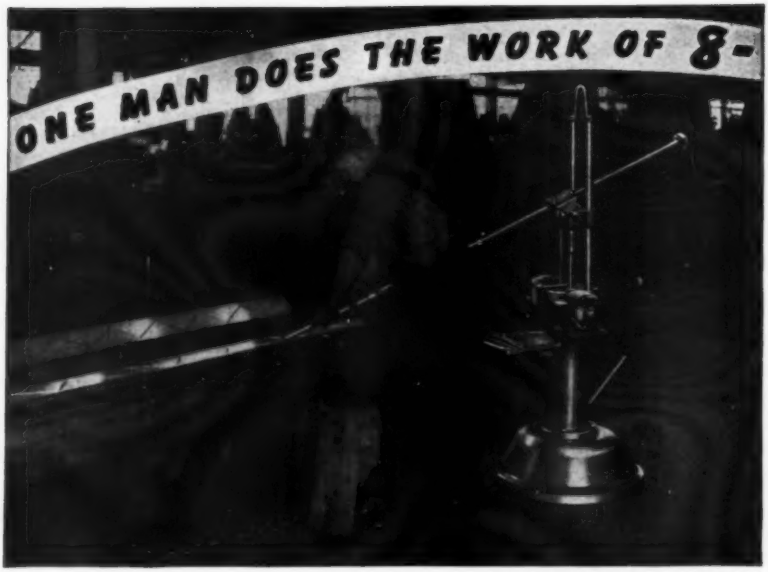

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Finishing Plain Bearings with Diamond Tools

By PAUL GRODZINSKI

VARIOUS investigations carried out during the last few years have shown that a highly polished and mirror-like bearing surface as well as a small clearance are of highest importance for the rate of loadability and the service which can be expected from a plain bearing. The usual methods of scraping and reaming are not altogether satisfactory, as in most cases the bearing surface has to be subjected to a run-in period. Owing to the uneven bearing surface when the bearing is assembled during the running-in time, a high initial rate of wear results which increases the bearing clearance. A strong impetus toward the use of better and improved methods of finishing bearings was given by the introduction of bearing metals of greater hardness, such as phosphor-bronze, lead-bronze, aluminum and magnesium alloys. These bearings must always be prepared in such a way that a perfect surface is presented to the hard shaft material in the assembled state; therefore, already in this state the necessary clearance between bearing shell and shaft must be provided. Table 1 gives a short survey on modern bearing materials, their usual clearance and capacity limits.

A bearing material of usual composition in nearly all cases consists of numerous hard crystals embedded in a soft matrix. These crystals are supposed to be the elements of the bearing metal which support the shaft, whereas the surrounding softer parts are intended to be attacked somewhat during use and should serve for retaining oil in the shallow grooves and pores. An assumption for this theory is that the structure of the metal surface is similar to that shown in etched microphotographs. It is obvious that such an ideal condition cannot be provided by scraping, as by this method

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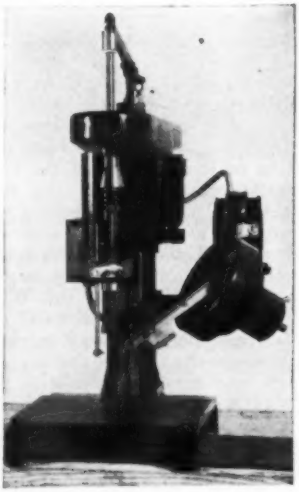

SEND SAMPLES FOR PRODUCTION ESTIMATE

DETROIT POWER SCREWDRIVER CO.
2009 W. FORT ST., DETROIT, MICH.

and also by the somewhat similar method of reaming, the tool edges tear out the hard crystal as owing to their slow motion the tool edges are not in a position to cut through. The pores and holes caused by the torn-out crystals are later on filled by particles of the soft matrix; the usual expression for this process is that the tool "smears." Only after an extended running-in period the damaged boundary structure is worn off and the real structure of the basic metal uncovered. As the damaged boundary zone has no hard crystals, the initial wear is increased with the inevitable result of a larger bearing clearance.

The need for precision boring of bearing surfaces is recognized by the use of a free cutting single tool point. This is a well-known method, but it did not prove successful in this case until the introduction of high speeds, smaller feeds and cutting depths, and, last but not least, of the hardest wear-resistant tool materials. A high speed rotating diamond or tungsten carbide tool cuts in spite of grooves, slots or surfaces of changing hardness and generates surfaces of exact geometrical form, usually cylindrical. The durability of diamond and tungsten carbide is, under these extreme conditions, quite different. Whereas a diamond tool can produce thousands of bearing bushes or brasses without any new adjustment—all being of high accuracy and between the prescribed allowances —a tungsten carbide tool has to be relapped and reground several times. Therefore, for small series production, and where shortest production times are not required, hard metal tools with lapped cutting edges may prove helpful.

The place of the diamond tool is in mass production and where closest tolerances and highest surface finish are demanded. The latter items show also its importance for single lot production.

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The fine feed grooves caused in the cutting process can be practically avoided by means of the so-called polishing cut, i. e. a very small clearance angle and the side cutting edge lying almost parallel to the already machined part of the surface. Round nosed tools with an included angle between 90 and 120° i. e. with adjusting angles of 45 to 30° on both sides, have proved productive of the best surfaces, the feed grooves being almost suppressed. It is also proposed to remove the fine feed grooves remaining from the diamond boring by a subsequent honing process. It may be of interest to mention that a honing process after the diamond finishing of the surface of aluminum bearings is protected by the German Patent 636,486. Also the recently evolved super-finishing process may eventually prove helpful in this direction.

Boring tools for machining of bearings usually have the form of boring bars with inserted tool shanks, either vertically to the axis or somewhat inclined to it. A special device is necessary to permit an accurate diameter adjustment in order to be in a position to use the same boring bar for different diameters, and to adjust the required dimensions up to ten-thousandths of an inch. New devices are so designed that the adjustment is carried out after the shanks have been clamped in position. Thus any subsequent error is avoided. Some difficulties are caused by the fact that after the stroke of the tool has been finished, it has to be withdrawn from the finished hole. To avoid a small scratch which endangers both the finished surface and the tool paint, several methods are in use; for instance, a radial withdrawal of the shank in the boring bar, an eccentric adjustment of the boring bar or a small eccentric movement of either workpiece or boring bar carrier.

The fine turning of bearings in single piece production can be carried out on high precision turning lathes. The boring bar can be fixed in the tool holder instead of the turning tool; flying boring bars are fixed in the spindle cone or are held between rotating or dead centres. In contrast to these sometimes primitive methods, which can, however, be converted into production schemes by application of special fixtures, fine boring machines have been evolved, usually operating

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	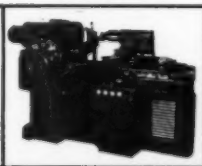	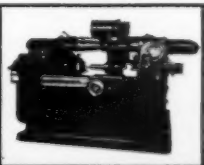	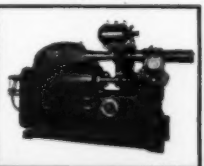

BRYANT CHUCKING GRINDER CO., Springfield, Vt.

in a horizontal direction. Generally the main elements of these machines are similar to those of the internal grinding machines. Besides the very expensive machines on the market, equipped with numerous time-saving devices, engine and bearing manufacturers have evolved their own special machines, frequently utilizing the basic elements of old lathes or internal grinding machines.

Special care has to be exerted in the proper selection of diamond tools. Not only that, — they should be ordered from reliable and experienced firms in this branch of industry. The tool supplier needs to know what materials have to be machined and what speeds and feeds are intended to be applied. It has been proved that the various kinds of diamonds found in the African and Brazilian mines are not equally adapted for machining the different bearing materials, such as phosphor-bronze, lead-bronze, aluminum alloys and Babbitt metals. In any case, the cutting angles should be adjusted for the material. Table 2 gives some recommendations in this respect. The feeds in bearing production are usually 0.0008 to 0.0016" per revolution to obtain a smooth bearing surface. The cutting depths are usually between the same limit and should be taken into consideration when the operating tolerances are fixed. The very small cutting depth which the diamond tools demand for a free cutting operation is of extreme importance for modern bearings, having in some cases liners of only some tenths of a millimeter thick. Exaggerated demands are frequently set with regard to the cutting speeds. According to recent experiences, speeds of 200 to 300 ft. per minute are sufficient to obtain satisfactory results. Every workshop will try to utilize the highest possible speeds in order to reduce production time, because the use of small feeds is absolutely necessary in this process.

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The Vernon offers a choice of two spindle speed ranges . . . 100 to 1000 r.p.m. or 150 to 1500 r.p.m. A convenient external handwheel operates fully enclosed variable speed drive—freeing operator from dangerous open belts. Longitudinal power feed is available as a standard extra.

The Vernon Universal Vertical Milling Attachment is extremely useful for high speed end mill work. Unit is quickly installed by replacing usual overarm and bracket. Head swivels at any angle—in any plane—making difficult setups easy. Maximum distance between collet end of spindle and table top—10¼"—ample for large jobs.

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FIELD ABRASIVE SPECIALTY MFG. CO. 203 LOWE BLDG., DAYTON, OHIO

To create conditions favorable for fluid film lubrication, cross grooves are generally avoided. Modern engine and machine bearings contain only a small circumferential groove to supply the oil to another shallow groove arranged in the middle of the bearing parallel to the axis. When utilizing diamond tools it is possible to produce these grooves before the finishing cut is applied, as the operation of the diamond is not disturbed by these interruptions.

The fine boring of bearing surfaces provides these advantages:

1. Bearing clearance measurable and pre-determined.
2. Reduced initial wear.
3. Big supporting area, already present in the assembled state.

With reference to 1, it may be mentioned that for bearings produced by fine boring, a larger bearing clearance can be permitted than in the case of scraped bearings. On the other hand, this guarantees that the clearance will remain constant for a longer time. As the new bearing materials have varying properties, other bearing clearances should be applied. Examples are given in Table 1.

With reference to 2, the lower initial wear provides for a longer period of service. Further, the shock loads in bearings on machines and engines with reciprocating movements are reduced in proportion to the smaller clearance.

With reference to 3, the greater area of contact gives a better distribution of the load and further promotes the transfer of friction heat from the bearing surface. The advantages of the precision boring of bearings by means of diamond tools are frequently recognized and acknowledged in technical literature.

Professor von Schwarz has stated in an article on "Quarzal Bearings" (aluminum with copper content) "finished with diamond tools, the running in is very much facilitated. The bearings can be easily and exactly machined."

In a brochure issued on designs of bearings, the boring of bronze bushes

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MISCELLANEOUS ACCESSORIES

WRITE FOR NEW ARBOR CATALOG No. 450 CONTAINING DETAILED INFORMATION

SCULLY-JONES AND COMPANY
1901 SO. ROCKWELL ST., CHICAGO, ILLINOIS

TABLE I—Fine-Boring of Bearing Metals.

	Material	Brinell-Hardness[1]	p_2	v_3	Bearing Clearance[4]
Fine-boring desirable	High tin containing Babbitt-metals	30 to 60			0.4 to 0.6
	Low tin containing Babbitt-metals	22 to 33			0.4 to 0.6
Fine-boring necessary	Lead Bronze	28 to 70	3.500	1.800	1.0 to 1.5 f engines 0.6 to 0.8 f mach. tools
	Phosphor Bronze	100 to 200	2.450	1.800	
	Aluminum and Aluminum Alloys	30 to 80	560 to 1.400	1.800	0.7 to 0.9
	Cast-Iron	140 to 200	420 to 1.750	180 to 540	0.6 to 3.0

1 Brinell Hardness in kg/mm² at 20 deg. Centigrade.
2 Maximum specific bearing pressure in lb./sq.in.
3 Maximum speed in feet per min.
4 Bearing clearance in 1/1.000 in. Diameter.

with diamond tools is recommended. Mann remarks, in an article dealing with bearing problems in high speed internal combustion engines, that the production of an accurate surface of highest finish is of fundamental importance for lead bronze bearings. It is necessary that the cutting tool should not exert a scraping action. This condition is only met by a cutting tool in which the formation of a built-up edge is avoided, in the perfect sense only performed by a diamond with properly selected cutting edges. In the second place, tools with tungsten carbide tips can be utilized. The bearing surface has to correspond in the assembly to the ideal surface in the rate of the hardness of the bearing material supplied.

In technical literature it is frequently mentioned that lead bronze bearings have to be finished by means of diamond tools, as the usual scraping method cannot provide for an adequate bearing surface.

The brochure, Lead Bronze Bearings, published by the Copper Development Ass'n contains on p. 41 the following passage:—"The best boring tool is a diamond, but a carefully lapped tungsten-carbide tool, though inferior, is satisfactory in some cases. The depth of cut should not exceed .004 to .008". Tool steels are not so suitable for this purpose."

In the manufacture of self-lubricating bearings using a porous bronze, it was very difficult to obtain bearing surfaces of a high degree of smoothness when using steel or hard metal tools. The fine pores became filled with chips smeared by the neighboring metal. This condition is not useful for such metals as thereby the self-lubricating action by means of the oil enclosed in the pores is seriously reduced. If, however, a diamond tool with polished cutting edges is properly applied, not only an improved and smoother surface is obtained, but also the pores of the metal remain open. Therefore, the standard practice is now to finish all such bearings with diamond tools. Only for bearings for high pressures is finishing by means of a hardened and polished steel arbor recommended.

It is known that engine bearings for aircraft and motor-cars are finished by means of diamond tools.

TABLE II—Cutting Angles For Diamond Tools. (Fine-boring).

Clearance Angle	8 to 15 deg.	
Rake Angle	0 to 3 deg.	For light metals alloys, soft bearings metals, etc.
	8 resp. negative up to 6 deg.[1]	For copper, brass and hard bronzes.

1 In special cases up to 20 deg. negative.

Fast Production Needs Correctly Ground Drills!

Grind them on a Sellers Drill Grinder

More vital than ever before is the need for correctly ground drills—for it is only when drills are properly shaped and have the right clearances and angles of inclination that they can be operated at maximum speeds and feeds.

Sellers Drill Grinders provide a simple and efficient means of accurately producing correct drill points and of *duplicating these points* on any number of drills.

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Aluminum bearings, which have been investigated by several firms on the Continent, can only be machined satisfactorily by means of diamond tools. It was reported impossible to use copper and silicon containing alloys, machined with usual turning tools and finished by scraping. On silicon content alloys one firm observed that the Si-crystals had been torn entirely or partly out of the soft matrix, and when further crystals had been broken out, the bearing was "freezing." With copper containing alloys one believes that either the matrix was smeared by utilizing softer cutting materials or that the hard $Al_2 Cu$ crystals are destroyed as are the hard crystals of Si containing alloys. This fact shows clearly that by means of the application of diamond tools, some of the difficulties in the machining of bearings can be avoided.

It may be mentioned in this connection that frequently bearings of plastic materials are also finished with diamond tools and that the highest speeds and pressures until now observed on such bearings, have been carried out with bearings machined by diamond tools.

Nylon Insulation

Nylon's efficiency as an insulator permits the manufacture of motors requiring 10 to 15 per cent less space than those of equivalent capacity using conventional magnet wire insulation, with a corresponding saving in vital core metals like iron, the Du Pont Company report.

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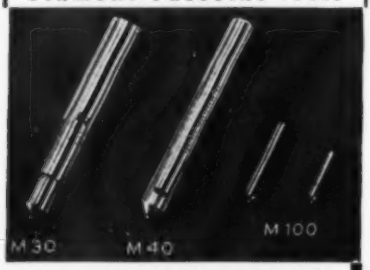
DIAMOND DRESSING TOOLS



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Speed-Up Your Machine Tool Operations.
Install **LIMA GEARSHIFT DRIVES** on all types of Metal and Wood Working machines requiring Selective Speeds. Sizes from 1 to 25 H.P.
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Induction Hardening Eliminates Bushings

BEFORE induction hardening was adopted by a large automobile plant, it was necessary to use copper bushings in the rocker arms to prevent them from wearing out the shafts. Increasing the shaft hardness from 20 to 50 Rockwell C by high frequency heating and quenching is reported to have resulted in a hardness sufficient to prevent shaft wear when the rocker arm is used without the copper bushing. Nearly 5 million shafts have been processed during the past two years without a single reject that could be traced to improper heating. Since about 14,000,000 bushings weighing 4/5 ounce each were needed annually, a saving of 35 tons of copper resulted.

In the manufacture of rocker arm shafts, the steel is cut in 12-½" lengths out of ¾" bar stock, and ground. Shafts are then bored, counterbored, and faced

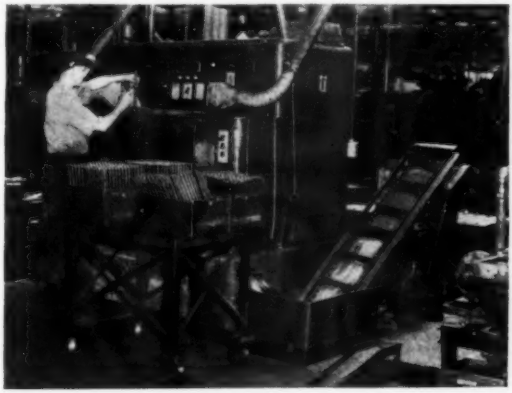
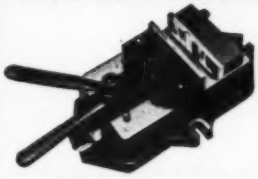


Fig. 1 — Rocker arm shafts are hardened in sections in this high frequency induction heating machine. The heating and quenching cycle enables one machine to process 12,000 shafts a day.

HARD USAGE Doesn't Faze The HARTFORD MILLING VISE



Because it was designed to "take it"—and it does! It will stand up, day after day, under the heaviest, toughest strain of production milling work. Made of the best materials, with all parts interchangeable, it will outlast four or five ordinary vises. Rapid and accurate in operation—the top eccentric handle gives tremendous binding force, while the lower cam-faced handle gives instantaneous quick-opening and return. A trial in your shop will convince you better than anything we might say.

Write for Folder and Complete Details

Jaw width ..... 5' **Maximum opening** 3½'
Jaw depth ..... 1⅛' **Weight** ..... 40 lbs.

Also made in the swivel-jaw type with hard or soft jaws, maximum opening 2¼'.

We also Build Machinery on a Contract Basis, Design and Develop Special Automatic Machinery—Gears and Cams Cut to Order.

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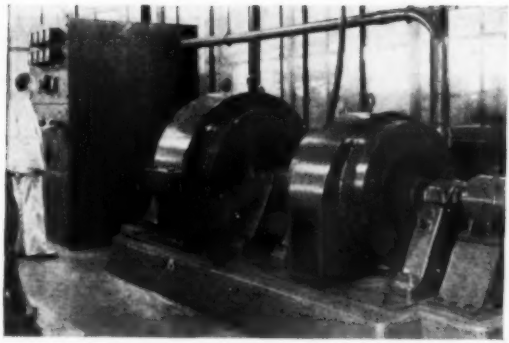

Fig. 2 — 3000 cycle Westinghouse generator supplies high frequency power to harden rocker arm shafts to between 49 and 51 Rockwell C.

for length simultaneously in one machine at the rate of 185 per hour, using 26 machines to maintain the present schedule of 12,000 units daily. The shafts are then hardened inductively by a "two shot" process, necessary because localized hardening at six different points around each oil hole in the shaft is desired. Units are dropped into holes where they are held in position by a cam supporting the end. High frequency current from a Westinghouse 240-kva 3000 cycle generator is applied at 3 sections which are heated to about 1500° F. and quenched. The cam then releases the shaft causing it to drop 2" and the process is repeated. Hardening of the entire shaft is not desirable as it would become brittle and susceptible to breakage.

Shafts are hardened six at a time in an upright hardening furnace in which the heating and quenching cycle is 4-½ seconds. No oxidation of the surface results, and there is no grain growth of the unhardened metal sections. Although there is some distortion of the hardened shaft, further machining except for finish grinding and lapping is unnecessary.

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Adjustable-Expansion
BROACH

Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cutter bars in carbon or high speed steel. *Details? Write!*

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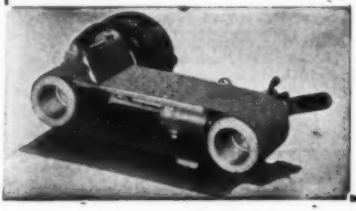

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The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemité lubrication, complete with grease gun.

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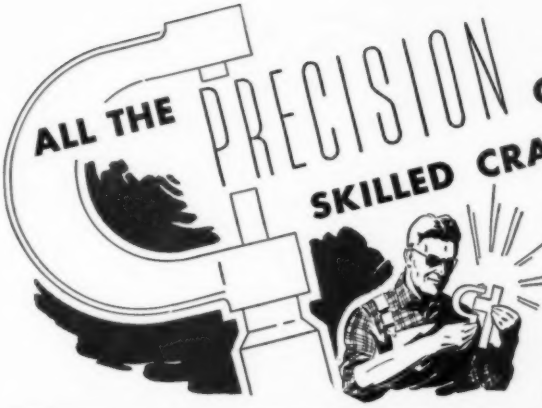

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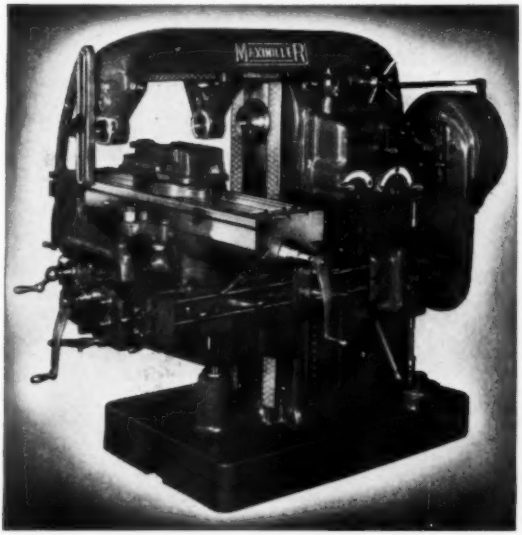

● The Kempsmith Maximiller is ruggedly constructed and has extra power to give it the unvarying ability to handle heavy, continuous cuts on long production runs with unusual accuracy. Available in Horizontal and Vertical types... the Horizontal in both Plain and Universal models.

The Kempsmith Type G geared-head milling machine is recommended for Tool Room work requiring precision and accuracy, and also for lighter production needs.

Dividing Heads • Heavy Duty Vertical Attachments • High Speed Universal Attachments • Slotting Attachments • Vises • Arbors • Rotary Tables

Catalogues and complete information sent on request.

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MAXIMILLER
MILWAUKEE, WISCONSIN

TOOL ROOM PRECISION in PRODUCTION by Broaching

THE JOB: To put machining of pump rotor slots on production basis.

THE METHOD: Broaching two slots at a time in two passes.

THE RESULT: Lower cost per piece, fewer machines, tool room precision in production.

BROACHING PAYS IN JOB LOTS..No. 5

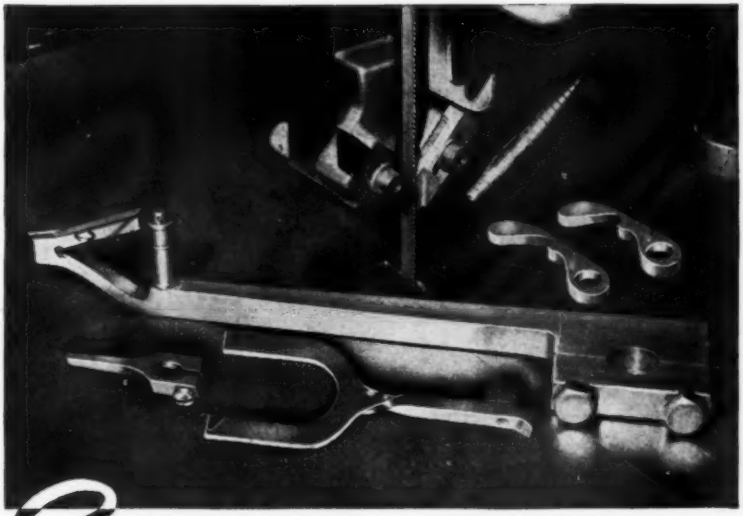
FACED with the problem of stepping up rotor production for precision hydraulic pumps from a-few-at-a-time to a capacity of several thousand per month, broaching was found to provide the answer to low-cost production accuracy.

On a job-lot basis, these slots —only about 5/64 inch across —are held to plus or minus two and one half ten thousandths with greater ease and uniformity by broaching than it was possible to hold the same parts, a few pieces at a time, by milling.

Even if the job could be done as well, it would have taken quite a few milling and drilling machines to do the same job as the single two-broach equipped Colonial.

More details on this operation are to be found in the current issue of "Broaching News". We'll be glad to send you a copy. Ask for issue No. 10.

COLONIAL BROACH COMPANY 147 JOS. CAMPAU ST. DETROIT, U. S. A.



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Yes Sir, they go right through any kind of metal or alloy with a speed and smoothness that is astonishing.

Above parts, formerly cut by hand, are now sawed on the DoAll without blueprints, for an automatic paper file folding machine at Linder Mfg. Co., Minneapolis. Savings in time are tremendous, according to Mr. Linder.

And, not satisfied with cutting ordinary metals, DoAll Saws do a real job on such tough ones as cold rolled nickel, laminated low carbon sheet steel, Neoprene, aluminum alloy, bronze, semi-steel castings, etc.

Available in various lengths, each saw comes in a patented metal box with a slot for saw to be pulled out and cut off as required.

FREE BOOKLET

"Actual Performance Records of DoAll Saws." Send for copy. It's short and interesting.

42 STANDARD SIZES DoAll Band Saws come in every size approved by the OPM, in Raker tooth, heavy set, A temper.

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Associated with Continental Machines, Inc., Minneapolis

DO ALL SAWS

MIDWEST MILLING CUTTERS

AND HOW BEST TO USE THEM

HEAVY DUTY PLAIN MILLING CUTTERS—This type of cutter is recommended where there is heavy production milling of materials in soft or alloy steel, bronze or copper. They have coarse pitch, undercut teeth with maximum backing behind cutting edges and ample chip space.

Midwest standard heavy duty mills have a smooth cutting action; they set up an end thrust which keeps the spindle tight in its bearings and eliminates chatter because they are made with 45° left-hand spiral teeth.

HALF SIDE MILLING CUTTERS—a type for heavy-duty straddle milling operations where only one side of the cutter is required for milling; also used frequently in pairs to mill a slot to fixed width but where finish at bottom is not important.

These mills have spiral, undercut teeth which provide particularly free-cutting action. Compared with side milling cutters, these half side mills show lower power consumption, more pieces per grind, and less idle machine time due to cutter changes.

STAGGERED TOOTH SIDE MILLING CUTTERS—This type of mill is exceptionally free cutting. For that reason it is ideal for deep slotting or the milling of keyways. The top teeth are undercut and have an alternate right and left-hand helix angle, which greatly reduces end thrust.

Since drag ends (inefficient tooth portions) are eliminated, increased chip room is obtained, and chip lengths are broken up, giving them the characteristic snap out of the cut. The sides of the teeth having no cutting action are "dished" slightly toward the recessed part of the cutter and this eliminates "bugging" of the cutter sides and, in turn, scoring the sides of the slot.

Many other types and forms of metal cutting tools are made by Midwest; catalog No. 17 contains illustrations and extensive information on them.

Any metal cutting problem inquiry you make will be carefully studied and analyzed. Suggestions and recommendations will be returned to you on types of tools to employ and how best to use them—a Midwest service entering its 31st year.

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2362 W. Jefferson Ave. Detroit, Mich.

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END MILLS • SLEEVES • COUNTERBORES • DRILLS
SPECIAL TOOLS • REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

Precision METAL CUTTING TOOLS

Plant Layout Facilitates Defense Lighting Production

By C. H. SMITH and R. W. MALLICK

WHEN it became apparent about 18 months ago that our nation was setting out on a vast program of national defense, the Westinghouse management began to review the manufacturing facilities at its Lighting Division, Cleveland, Ohio, since good lighting is essential to defense industries and military needs.

After careful studies of existing facilities and anticipated demands, an expansion program, doubling the normal plant capacity, involving over a year's work and costing nearly one million dollars was laid out.

Beginning with a complete relayout of all manufacturing, storage and service facilities, one completely new one-

"DAYLIGHTED" MACHINE SHOP—Several types of fluorescent lighting fixtures are used to light this machine shop in the manufacturing addition. Punch presses are in the background, and in the foreground is the drill press section. In the center are miscellaneous machines such as turret lathes, screw machines, boring mills, etc.

LIGHTING FOR DEFENSE—Revamped production aisle in the old manufacturing building where all machining, fabricating and welding is done. The reflectors in the lower left corner are spun from aluminum disks. This portion of the plant is now on a 24-hour per day schedule.

story building was designed and built; two stories each were added to an existing manufacturing building, and to an existing foundry building; the boiler house was completely razed and rebuilt with a new 420 horsepower boiler installed to augment two existing boilers; receiving and shipping facilities were completely revamped; and the entire plant service facilities were renewed or rehabilitated.

Simultaneously with the construction of the pattern storage building, the site was cleared and excavation started for the two-story addition to the buildings which housed the actual manufacturing of lighting apparatus.

Here the problem was not so easy. With a greater backlog of orders than ever in the history of the plant, production had to be maintained in some instances for 24 hours a day, and construction problems had to be subordinated to production. Despite the fact that construction started during the coldest month of the year (January 1941) and one end of the factory had to be completely demolished and exposed to permit new construction, both production and construction proceeded on schedule.

To accomplish the task of keeping production moving, the newly completed pattern storage building was temporarily turned over to the factory for use as an asembly plant and temporary assembly lines were set up. Five conveyorized lines were put into operation with a total capacity of 500 fluorescent fixtures per 8 hour shift. By this means it was possible to manufacture and ship such orders on time as lighting equipment for the Wright Aeronautical Co., at Lockland, Ohio, which required about 18,000 fluorescent fixtures alone.

Due to certain limitations as to space, existing building, and transportation facilities, to obtain the highest efficiency from the new layout a "C"

Save GRINDING TIME
Save METAL . . . .
On Your Steel-Cutting Carbide Tools

Order SHAPED KENNAMETAL TIPS For Non-Standard Tools

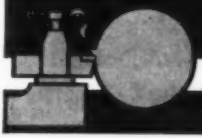
While McKenna Metals Company recommends the use of Standard or Modified Standard KENNAMETAL tools wherever possible, there are cases where non-standard tools must be used. KENNAMETAL tips, formed to the required shape, are supplied at no extra cost where no internal angle or radius is required. Use of these shaped tips avoids excess grinding and consequent waste of time and material.

The price of KENNAMETAL shaped tips is based upon the rectangular piece from which the formed blank may be cut. Catalog No. 42 lists prices for blanks of standard shapes and sizes. Write for your copy. Special blank prices are quoted on request.

KENNAMETAL *The Accepted* STEEL CUTTING CARBIDE

Special tips are shipped promptly, prices quoted on shapes per your drawing or sketch.

"LARGEST MANUFACTURER OF STEEL-CUTTING CARBIDE TOOLS"



McKENNA METALS Co.

135 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

Canadian Representatives: KENNAMETAL TOOLS & MANUFACTURING CO., LTD., 24 Dunbar Ave., Hamilton, Ont.

shaped material flow had to be established. Raw materials are received into the plant by rail and motor truck. Since it is always most desirable to have all material received at one point, the receiving department had to be located at a point which would have both these facilities. The same was true of shipping. In the case of shipping, however, the problem of shipments from warehouse as well as direct shipments from the factory had to be considered, since nearly 50 per cent of the volume shipped originates as warehouse stock. An eight-story building is used as the warehouse. Therefore, it was most advantageous to ship from this point.

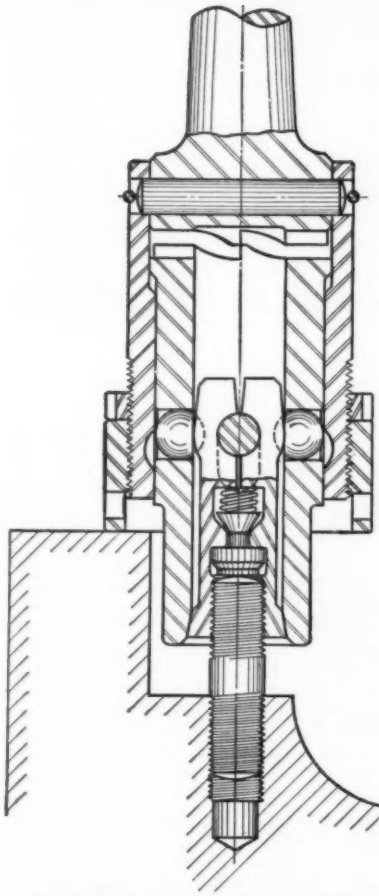
These two "anchor points", the receiving and shipping activities, were most nearly fixed by geographic limitations and the problem then resolved itself into obtaining the best layout possible between these two points.

The type of product handled at this plant does not lend itself to manufacture in a multi-story building with any degree of efficiency. However, the problem remained of getting a sufficient amount of floor space under one roof and between the two fixed points to accommodate the productive capacity required. Also, in the new layout it was deemed advisable to revise certain manufacturing processes and methods to allow for better production and cost control, as well as to obtain a better productive flow of materials.

It was immediately recognized that a one-story structure would not provide sufficient floor space to accommodate the most advantageous layout from this standpoint. By study and experience, it was concluded that the raw material storeroom be located immediately adjacent to the receiving department since 85% of the material entering into the product had to be

CONVEYOR—More than a mile of conveyor lines in three of the new buildings help to double productive capacity of the plant. The conveyor at the right carries single-tube fluorescent fixtures; the center line is for packed sterilamps, and the conveyor on the left carries four-tube fluorescent fixture assemblies. All three lines are moving towards the packing room from which they proceed to the shipping room store room, or warehouse.

ARE YOU SETTING STUDS MANUALLY WHEN A MODERN STUD SETTER CAN SET THEM QUICKER AND CHEAPER?



Don't let appearances deceive or past practice influence you. Just because you have been setting your close centered or close to shoulder studs by hand, don't shut your mind to the adaptability of a MODERN Self-Opening Stud Setter to your job.

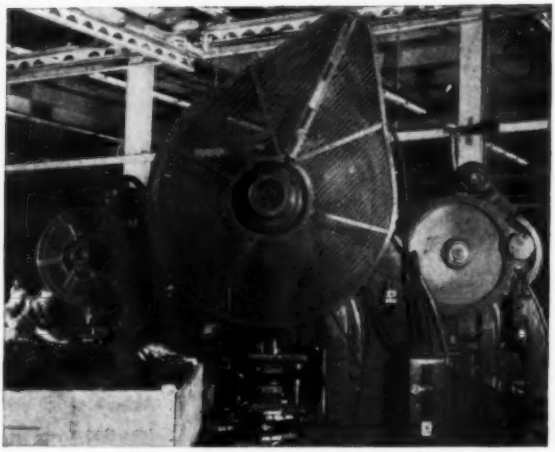
Many stud setting jobs that had been done by hand for years and had seemed to preclude the use of a power-driven stud setter are now being driven by special applications of MODERN Self-Opening Stud Setters. One of these special applications for setting bearing studs in cylinder blocks is illustrated here.

So if you are now setting studs by hand, tell us about it. Maybe we can work out a way for you to save time and costs on your jobs as we have for others. A bulletin, too, is available upon request.

MODERN TOOL WORKS

DIVISION OF CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER • NEW YORK



STAMPING—Small pieces such as housings and covers are stamped on these machines. The three presses are fed from new type adjustable height racks.

INCLINED CONVEYOR — This reversible conveyor carries materials at the rate of 125 feet per minute from receiving dock to storeroom. Part of 5500-feet of new conveyor systems, this belt is 50 feet long and three feet wide.

handled through this storeroom, while only 15% went direct to the shop. To allot all the required space necessary to raw material stores would have left too little space for manufacturing and other succeeding activities.

After further analysis, it was found that the storeroom could be divided into two categories; one consisting of relatively heavy and active materials with rapid turnover, and the other consisting of relatively light materials of slower turnover. By such a division and using mechanical handling equipment it was found that storing the slower moving, lighter materials on a second floor would be no detriment. This led to the designing of the two-story factory addition mentioned, which, in turn, provided sufficient space to accommodate the layout previously determined from production requirements.

Most of the equipment manufactured in this plant, i. e., industrial and commercial lighting fixtures, marine and aviation lighting equipment and Precipitrons, does not lend itself to "straight line" production in the same

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OF TOP QUALITY
BEARINGS

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sense as when the term is applied to such products as automobiles, since every order must be routed individually. Although nearly all designs are standard, customers very frequently specify some special feature to accommodate an architectural requirement such as special finishes or hardware, or local building codes may necessitate a change from standard design.

With this knowledge of production limitations, plans were made to design a manufacturing layout that would contain as many of the desirable features of "straight line" production as possible, without the inherent handicaps, i. e., dependency on continuous and uninterrrupted flow.

A study of production conditions and material flow revealed that by interposing "matching centers" for material at certain points in the layout between successive manufacturing operations, a nearly "straight line" flow could be obtained. The principle of progressive flow with lateral feeders was applied to the layout. The "matching centers" serve to take up the slack and smooth out interruptions and, in addition, eliminate most of the delays due to not having the proper material in the right place at the right time.

PUNCH PRESS—This punch press operation forms small metal fittings used in assembly. Bundles of bar stock are brought to the trough by cran-

SAND BLASTER — This industrial "boogie-man" cleans and smooths the surfaces of metal castings.

Material is received either by truck or rail in the receiving department. Every piece of material is checked, then sent to the raw material storeroom, production dispatch station, or finished parts storeroom, depending upon the type of material and where it enters into process.

We can now follow a hypothetical product through a typical manufacturing cycle. Let us assume that it origi-

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★ WASTE OF POWER
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★ WASTE OF ENERGY
★ WASTE OF METAL

DO-ALL Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

4 CORNERS CUT IN 4 HOURS

With the DoAll a 4½"x2½" cut was made in each corner of this 18" thick, 945-pound MO-LYB-DIE Hardtem B block. It took only one hour to notch each corner. The saw cut very straight and the job turned out beautifully.

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12 HOURS 40 MINUTES SAVED

Four pieces of Water Hardening Tool Steel 2" x 10" x 11" formerly done on shaper in 14 hours, now sawed on the DoAll in 1 hour and 20 minutes.

Swanson Tool & Machine Co., Erie, Pa.

SAVE WITH THE DoAll

This ultra-modern machine tool offers you the fastest, most efficient way of removing metal, any kind, from hardest high carbon steel to soft brass. Does internal and external band sawing, filing and polishing. The DoAll cuts corners all along the line—takes the place of shaper, milling and lathe work in industrial and defense plants everywhere.

Let us send a factory trained man to your plant to demonstrate just what a DoAll can save you.

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Associated with the DoAll Company, Desplaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

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WATERWAYS FOR SEAPLANES are lighted by these seadrome lights. The units are mounted on doughnut-shaped rubber tubes and are remotely controlled by radio. A line of these units can convert any open water area into a landing base for seaplanes.

nates as raw material in the raw material storeroom. The correct quantity and size of material is sent by the storeroom to the production dispatch station. The storeroom cuts, shears, weighs out, or otherwise supplies the correct amount for a given order. The material is then sent by conveyor or caster truck to the dispatcher.

When all the material required for the first operation is on hand, the dispatcher routes the order to the manufacturing department, usually with drawings and tools necessary to perform the specified operations. If the material can be accommodated in tote boxes, it is sent over by conveyor, automatically controlled from the dispatch station. If the material is too large for tote boxes, it is delivered on caster trucks by a "move" man. By this means, the dispatcher can control production very readily. The shop can work on the various orders in the proper sequence since only such work is dispatched as may be required and all other material is held in the dispatch station. This then becomes the first "matching point" in the layout.

After the specified operations are completed on the first assignments, the material is returned to the dispatch station for reassignment until all so-called "feeder operations" are completed. These may be any or all of the following processes:—metal stamping, machining, spinning, welding, sub-

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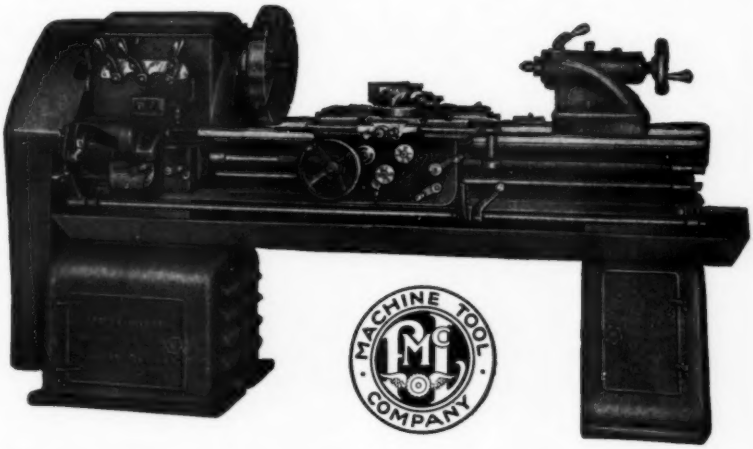

16 Inch—12 Speed—Geared Head—Quick Change

Swing over bed	17"
Swing over carriage	11½"
Dist. bet. centers (6' bed tailstock flush)	36"
Dist. bet. centers (tailstock overhung)	40"
Tailstock spindle travels	5¼"
Tailstock spindle diameter	2¼"
Taper of Centers	No. 3 Morse
Front spindle bearing	Timken
Rear spindle bearing	Timken
Hole through spindle	1 5/16"
Diameter threaded nose	2 3/16"
Number of threads on same	7 per inch
Number of threads and feed changes	40
Stand. lathe will cut following threads per inch: 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28, 32, 36, 40, 44, 46, 48, 52 and 56.	
Leadscrew threads per inch, Acme thrd.	6
Width of Belt	2½"
Steady rest opening	4½"
Driving pulley diameter	9"
Revolutions per minute	410
Highest gear ratio	42 to 1
Number of spindle speeds	12
Minimum & Maxi. speeds	15 to 500 R.P.M.
Weight on skids (6' bed)	3400 lbs.
Weight crated (6' bed)	3700 lbs.
Wt. boxed for Ocean shipments	4200 lbs.
Export boxes (6' bed)	102" x 38½" x 62"
Weight per extra foot of bed	150 lbs.
Size of tool	1¼" x ⅝"
Largest diameter held in split chuck	⅞"
Lathes furnished with 5, 6, 7, 8 and 10 foot beds.	

Engine Lathes Cold Sawing Machines Abrasive Cut Off Machines

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BENTON HARBOR, MICH.

assembly, cleaning, plating, painting or polishing. The dispatcher has full control of work assignment and in this way can route jobs to the best advantage and stabilize the work in the shop as well as give preference to specific orders.

Should any one department be low on work, he may start out jobs that may not be required immediately, then hold the parts in the dispatch station before routing for succeeding operations. Or, he may hold up less important orders to give way to urgent work.

PAINTING—When floodlight brackets come in from machining operations, they are put through a degreasing operation, hand-dipped in a paint vat as shown, and hung on racks for drying. From here the brackets are sent to the storeroom and then to the assembly lines. Special equipment removes paint fumes from the totally enclosed paint room.

When all the "feeder operations" have been completed, the material is sent to the finished parts storeroom

★ ★ ★ ★

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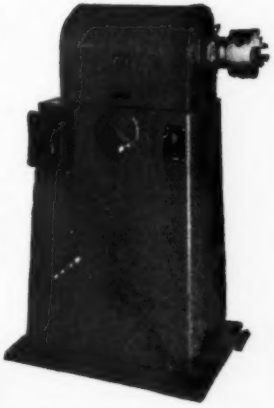
SPEED LATHES

are working for the U. S. A.

Speeds production more economically and more accurately. SCHAUER Speed Lathes are used for final finishing operations; BURNISHING, POLISHING, LAPPING, and BURRING of ball bearing races, headless set screws, gears, pinions, pulleys, spinning rings, screw machine products, wire drawing dies, and other similar products.



TYPE VA3B VARIABLE SPEED LATHE

Especially designed for precision lapping of gages at extremely low speeds (from 20 R. P. M. up to 4,000 R. P. M.) and for finishing operations, as may be required. In addition, there is plenty of power for rotating heavy work.

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TYPE NA1C Hand-Operated Collet SPEED LATHE

Adapted for general finishing work as burring, polishing, or lapping of gears, dies and numerous other production pieces.

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SCHAUER MACHINE COMPANY

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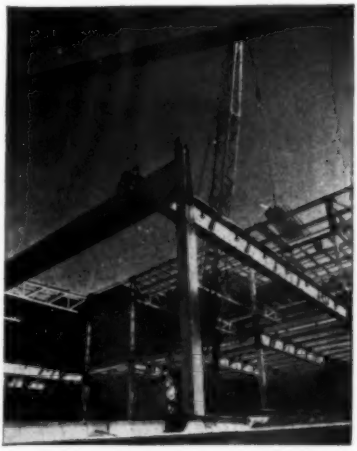
or dispatch station No. 2, depending upon its classification. Material that is made for stock and carried on ledgers is held in the finished parts storeroom until requisitioned. If it should apply on a customer's order, it is sent to the dispatch station for matching with other parts applying on the order and is held there until it can be released for assembly and shipment. This now becomes "matching center."

As mentioned previously, most so-called "standard fixtures" must have certain special features to satisfy customers needs. Several years ago an analysis was made to determine how many component parts of each assembly were interchangeable on similar apparatus. The survey revealed that from 85 to 95% of the parts were standard and this led to a policy of stocking parts rather than finished units. Stocking parts gave the advantage of lessening large warehouse stocks of finished units and quicker service to customers, as it was often necessary to dismantle a finished unit to bring it up to order specifications.

When an order is ready to assemble, the dispatcher collects all of the special material required for the order, and requisitions the stock parts from the finished parts storeroom which is located adjacent to the dispatch station. When all is in readiness, he sends the order by caster skid to the head of the assembly lines.

With exceptions such as apparatus that cannot be moved on conveyors due to physical dimensions or design, all assembly is done on roller gravity conveyors. Each unit is assembled progressively and, after the final operation, is inspected and ready for packing. Assembly conveyors extend to the packing floor, and this operation is also done on conveyors or special benches designed to keep all material within the effective working radius of the operator.



RECORD SIZE 36" I-BEAMS were used in the all-welded beam construction of the new additions. The buildings were designed and erected by the Austin Company under direction of the Westinghouse Construction Department.

Lighting fixtures, as a rule, can be easily damaged in handling or transit since they are not designed for abuse. This means that packing is a relatively important operation, and requires a considerable amount of bulky materials. Due to the volume handled, the

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The SUNNEN PRECISION HONING MACHINE
is Helping to Speed Up DEFENSE PRODUCTION by Handling Jobs Like These FASTER, More ACCURATELY

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Better finish and alignment maintained on yoke for compressor.

"Strict alignment maintained between two holes."

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

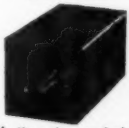
Aircraft Valve Tappet Roller. 4-Micro finish.

Mild Steel Clevis. Honing was used to correct errors of previous machining and maintain true alignment of the two bearing surfaces of this clevis.

Aluminum Aircraft Link "produces high finish without bell-mouthing."

Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.

Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness.



Saved time in producing a smooth accurate finish on this bronze remote control valve body.

Grinds and finishes internal cylindrical surfaces from .185" to 2.400" with guaranteed accuracy of .0001". Relieves big internal grinders. Does not require skilled labor! Can be set up in less than a minute. Is saving money, increasing production, and improving quality for hundreds of manufacturers handling important defense orders.

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giving complete information, or if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do on your job.

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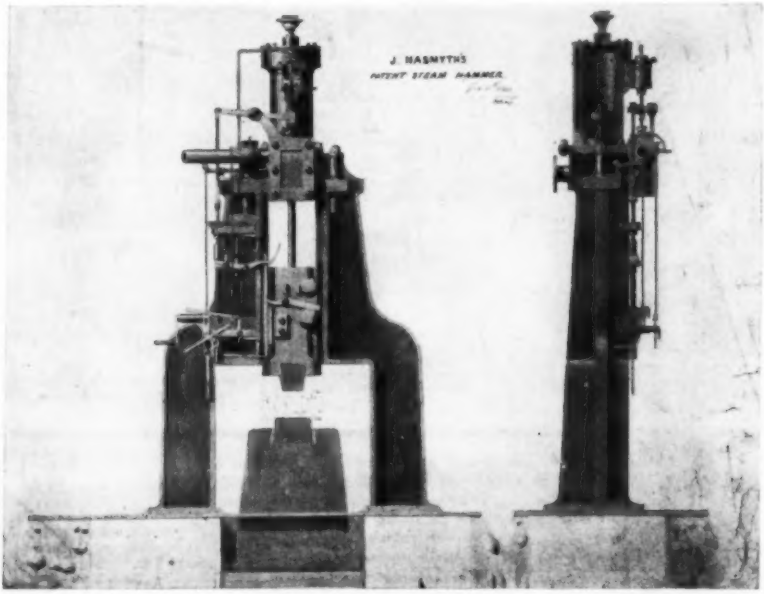
stock of materials necessary to keep on hand is quite extensive, and this packing is one of the principal items placed in the storeroom on the second floor of the new addition. However, the problem remained of getting the proper materials in the correct quantities to the packing floor at the right time so that units coming off the assembly line could be packed without delay.

Belt conveyor was installed to accomplish this, and by arranging a switch and spur to the No. 2 dispatch station, materials entering into the assembly that are stored in this storeroom unit are carried by the conveyor directly to the shipping floor.

After the material has been packed, it is turned over to the shipping department, located on the same floor, for shipment or warehousing. If same is for warehouse stock, it is transferred by caster truckload on an elevator to the upper floors which are used for that purpose. If it goes into direct shipment, it is moved to the loading platform which has been designed to accommodate six trucks and one freight car at one loading.

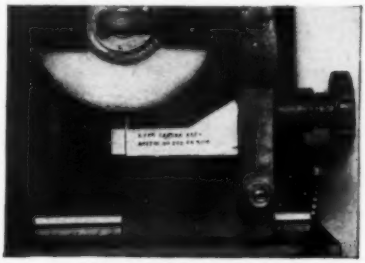
American Firm Receives Nasmyth Drawings



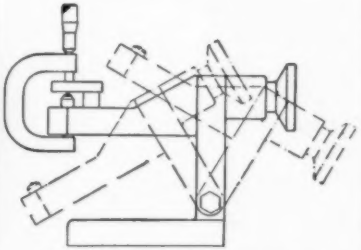
The Institution of Mechanical Engineers, St. James's Park, London, has presented to Chambersburg Engineering Co., Chambersburg, Pa., makers of forging hammers, Ceco-stamps, presses, etc., the original wash drawing of Nasmyth's Patent Steam Hammer dated Jan. 4, 1844, as well as two other interesting wash drawings of Nasmyth machinery. Made before the days of

New C-66 RADIUS DRESSER for SURFACE GRINDERS

A low-priced, rugged attachment for any make of surface grinder. Mounts directly on magnetic chuck. Dresses wheel without dismantling machine—a one hour job in 10 minutes.



C-66 Radius Dresser forming female radius.



Setting diamond with micrometer for accurate radius.

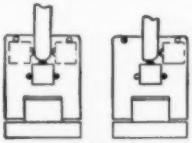
The C-66 will accurately dress wheels to both male and female radii. Operation is open and easy to see. For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

Vee Ground in Center of Arm

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing

Prompt delivery from factory in Newark. Sold on 10-day Free Trial. Price, without diamond, $72.50. ¼K diamond, $5.00.

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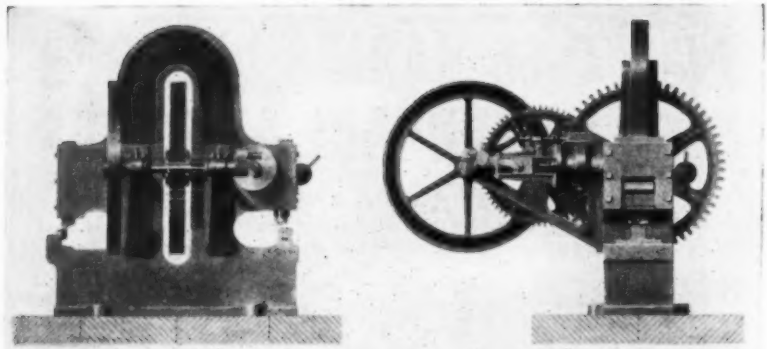
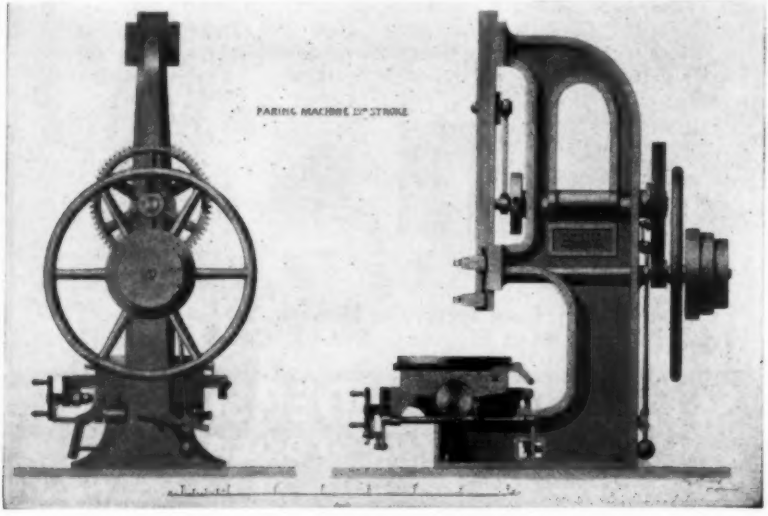


STEAM PUNCHING & SHEARING MACHINE

photography and the air brush, these drawings have the smoothness and detail in highlighting and shading of a modern air-brushed drawing or retouched photograph.

In presenting the drawings through the American Embassy, to Chambersburg Engineering Co., the Secretary wrote:—"The Institution is glad to make a gesture of international goodwill by the presentation of these historic drawings."



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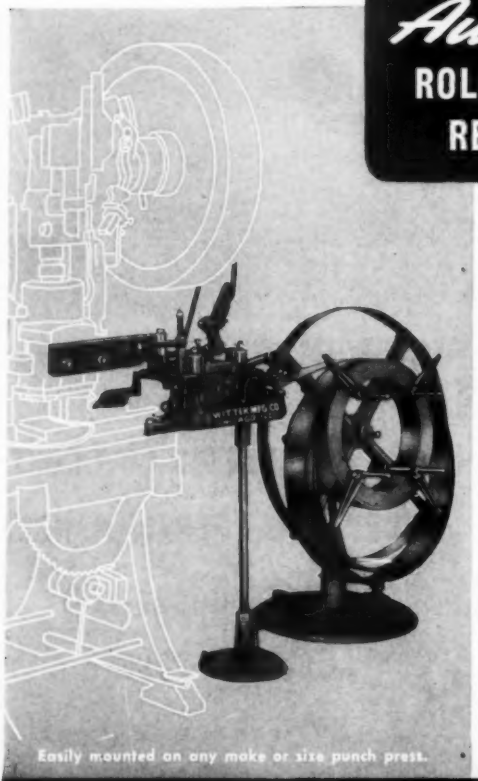

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★ Wittek Automatic Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Made in four different types to meet all automatic feeding requirements.

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"Let's Talk Shop!"

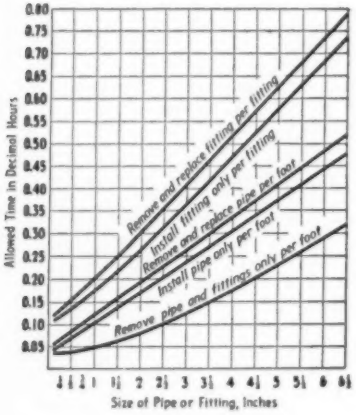
Time Study of Pipefitting Leads to Incentive Plan

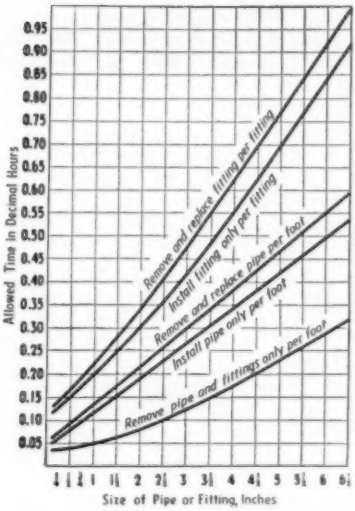
IN order that management may more closely control its pipefitting costs and the men receive just compensation for their work, a measurement system has been devised at the East Pittsburgh works of Westinghouse whereby the complex variable time values for pipefitting can be compiled in chart and curve form for simple computation and application. It has been noted that under this new system there has been a decided decrease in supervision cost and the men have been able to increase their earnings through improved performance.

Extensive time studies were taken covering all phases of the work and where possible, standard methods for performing work were formulated. The three kinds of pipe handled, namely, standard, hydraulic, and cast iron had a decided effect upon the cutting, welding, and threading time due to the various thickness and a slight influence on the handling time due to the variances in weight. Other time studies were compiled for such variable factors as:—Diameter and length of pipe; the type of fitting; the location, whether in a ditch or under the floor, at floor level, or overhead; type, size, and gauge of the bends; outdoor weather conditions; amount of removal of old pipes.

To all time computed from the charts is added an amount to cover the set-up time for collecting tools, equipment, and material and moving to the job. Also included is the time required on the part of the group leader for supervision and necessary for time keeping.

Fig. 1 shows the portable pipe equipment of pipe machine, tool box, and vise in portable forms so as to expedite work at point of installation.





The charts show allowed time plotted against the size of pipe of fitting. (a) Time allowances on operations performed when installing or repairing pipe lines in a ditch or at floor level. (b) Time allowances for installing, removing, replacing pipes when installing or repairing pipelines overhead.

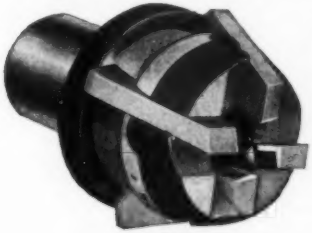
Fig. 4 shows 45° offset welding with the pipefitter welding 8" water main to provide clearance for new crane runway.

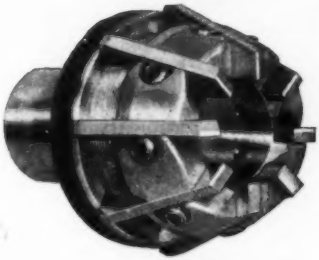
Shims in Carbide Setups

When tool holders with wedge type seats, as illustrated in Fig. 1, are not available, this method may be used effectively, according to Carboloy Co., Inc., to cut machine down time while setting up reground carbide tools to correct cutting position.

Fig. 2 shows the tool with tip location below correct height for cutting with carbide tools, as a result of grinding on top of tool. To overcome this, grind a depression behind tip in the shank equal in depth to the total amount ground off top of the tip during entire life of the tool.

GENESEE ADJUSTABLE HOLLOW MILLS





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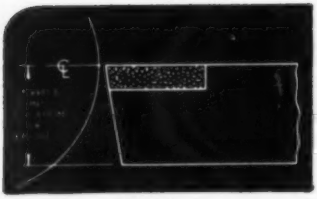

Fig. 1

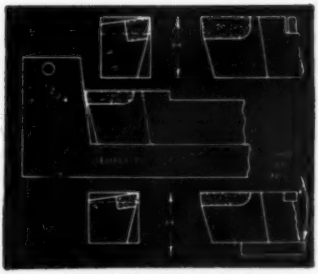

Fig. 3

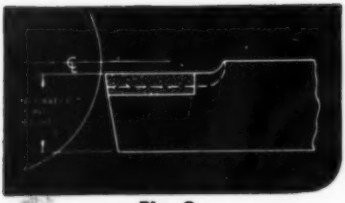

Fig. 2

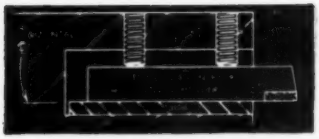

Fig. 4

Next, a template should be graduated as shown, (Fig. 3), numbering it to indicate the number of the correct shim to use under the tool or the number of the set of shims to use if one is used top and bottom.

SIMPLIFIED INTERNAL GRINDING
with the MAJESTIC INTERNAL GRINDER

An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

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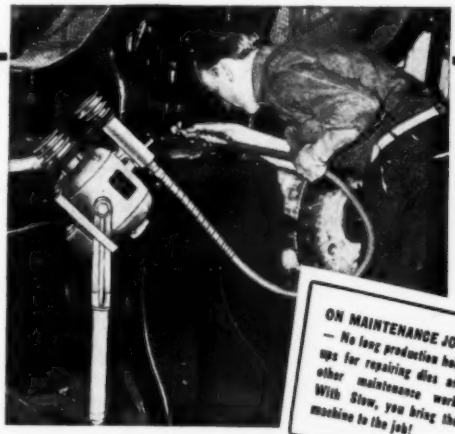
STOW

FLEXIBLE SHAFT MACHINES



ON MAINTENANCE JOBS — No long production hold-ups for repairing dies and other maintenance work. With Stow, you bring the machine to the job!

Stow units are true "many-purpose" machines—equally useful on every one of hundreds of jobs. During one shift, they may be on a grinding job. The next shift, they may be changed over for drilling. Then to filing, wirebrushing, sanding, buffing or polishing. And every job will be done right, with the right tool at the right speed!

SPEED UP PRODUCTION—Awkward grinding jobs like this are done easier, faster, better with Stow.

There's a vital difference in Stow Flexible Shaft Machines that shows when going is toughest. Stow machines are built to take it—to stand up under month after month of three-shifts-a-day punishment. Their quality is backed by 66 years of experience in flexible shafting—the most extensive in America. Let the name Stow be your guide in buying flexible shaft machines. It pays!

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30 SHEAR STREET BINGHAMTON, N. Y.

Inventors of the Flexible Shaft

(Pronounced COLE'-MON-OY)

Sure! They are worn. They've had tough going these last few months. But there's no need to scrap them.

Now it's quicker—cheaper — to hard-surface all wearing parts with COLMONOY. On machine tool parts such as lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, centerless grinder rests COLMONOY No. 6 is proving invaluable. Equipment that must take a lot of punishment—perhaps for 24 hours a day—will operate efficiently, with less wear, when the proper grade of COLMONOY is used as a hard-facing for all parts subject to excessive abrasion and corrosion. It will pay *you* to investigate.

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For back tools, (Fig. 4), tool holders should be designed so that the tool will be in correct cutting position when it has been reground the last time. When a new tool is inserted, a thick shim is then used, and each time the tool is reground, the shim thickness is decreased an amount equal to the stock removed from the top of the tip.

Ingenious Dust Collector

The wheel shown is used for rough grinding of castings in the plant of the Reliance Electric & Engineering Co., Cleveland, and consequently has been provided with a large capacity dust collector in the familiar form of a galvanized waste can. Holding 75 pounds of chips and grit, this container needs emptying only about once a month.

Fig. 1—Because this wheel is used for rough grinding of castings, it has been provided with an extra large capacity dust collector.

A blower, driven by a 1-hp. motor, sucks the dust at high velocity through a short length of hose into the comparatively large area of the can interior. Here much of the velocity and carrying power of the incoming dust-laden air is lost as it circles in a cyclone motion around the outlet tube, which extends

GUARD PRODUCTION'S LIFELINE, TOO!

By Increasing Tool Life; By More Accurate Reconditioning of Your Cutting Tools; By Stopping Wasteful Hand Grinding.

There is a real opportunity for savings in your tool reconditioning departments. If you will eliminate those obsolete methods and machines and install Modern Oliver Tool Conditioners you can *Conserve* those "hard-to-get" cutters and tools, *grind them in less time and keep them on the job longer.*

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Now is the time to investigate the savings possible with the ACE Universal Grinder, the 510 Drill Grinder, the ARC Grinder for Radius work and the NEW TEMPLATE TOOL BIT GRINDER.

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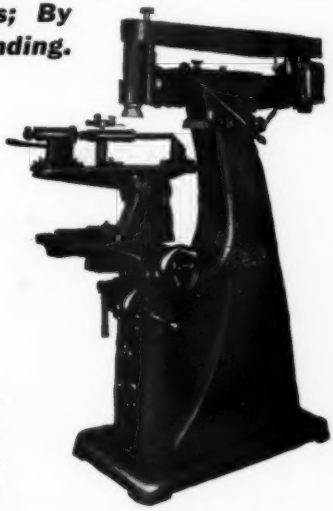

Cut illustrates the new Universal Tool and Cutter Grinder — handles a complete range of cutters and tools — simple to set-up, easy to operate—efficient on all operations. Reasonable price. Send for 12-page circular.

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half way from the bag to the bottom of the container. The particles fall into a separating baffle at the bottom of the can. This separating baffle consists simply of two pieces of sheet iron set on edge and at right angles. The baffle stops the spiraling effect of the dust as it nears the bottom of the container, and also eliminates the possibility of subsequent turbulence in the dust after it has once been deposited.

When the operator stops the blower, he gives the fabric bag two or three vigorous shakes to release from it what dust has not already found its way to the bottom of the can. This insures that a clear air passage into the bag will be maintained without removing it or otherwise disassembling the simple dust collector unit.

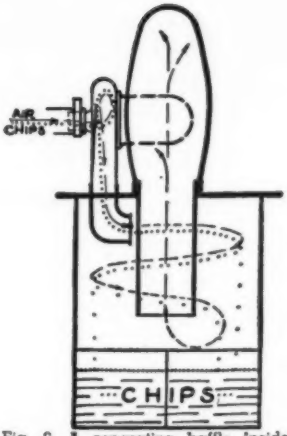

Fig. 2—A separating baffle inside the container breaks up the spiraling travel of the dust and causes it to settle quickly.

Hints on Chaser Care and Threading

The following useful hints on chaser care and threading are from the "National Acme Chaser Grinding Manual" (Book D-41). Offered at 25 cents by National Acme Co., 170 E. 131st St., Cleveland, O. it deals primarily with the methods of grinding chasers,

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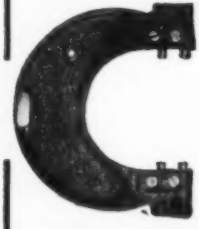

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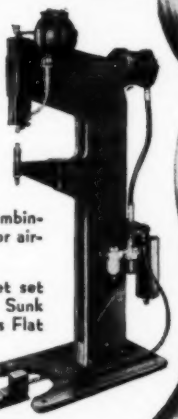
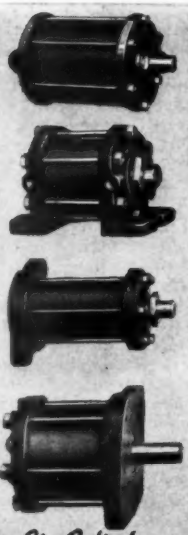


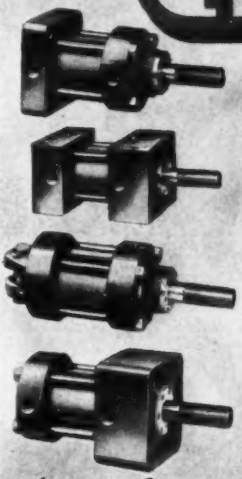
Furnishes "air squeeze" action combined with automatic feed riveting for aircraft production.

By using a different type of rivet set and jaw construction, Counter Sunk Head Rivets are handled as well as Flat Head, Round Head, Full and Semi-Brazier Head Rivets. For specifications, etc. write Dept. H.



Air Cylinders

T-J



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These units exert power movement from 100 lbs. to 12,000 lbs. (direct). Made in styles, sizes and strokes to meet your requirements.

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Designed and furnished in types and sizes to exert power movement from 1,000 lbs. to 50,000 lbs. (direct).

For Catalogs on these cylinders write Dept. H.

THE TOMKINS-JOHNSON CO.

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whether circular or radial types, used in their self opening dies and collapsing taps. The instructions given also apply to servicing circular hollow milling cutters.

Chaser "Don't's"

DON'T run chasers too long between grinds. Grinding more often increases chaser life — and results in better threads.

DON'T use poor cutting oil.

DON'T use die head or tap with weak chaser springs, or clogged with chips —keep the tools clean and the chasers sharp.

DON'T use chasers with different throat angles in the same set.

DON'T let your threading spindle and work spindle get out of alignment. Threading machinery that is kept in alignment means less fussing with the threading tools — more and better threads from your chasers.

DON'T grind in one spot when sharpening chasers. Take light, fast cuts to avoid burning the chaser.

Hints for Solving Chaser Problems

Eccentric Threads: Check alignment of die or tap with the work. Bevel the piece, so all chasers can start cutting at the same time.

Out of Round or Wavy Threads: Use more face angle or grind less off the face — have micrometer reading show more over center on the chaser setting.

Rough Threads: May be due to too much surface speed or poor cutting oil. Grind a little more off the face of the chaser.

Chattered Threads: Grind to get a higher micrometer reading if chattered on both sides; if only on one side, check lead and correct as explained for threading ahead or behind on lead.

Shaved Thread: Check lead and correct if threading ahead or behind.

Threads Rough on Top: Use more hook angle on the face of the chaser.

Threading Ahead on Lead: Grind more off the face of the chaser—less over center on your micrometer reading.

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Increased production facilities mean normal deliveries NOW and in the months ahead, on all Willey's Standard Tools as well as blanks of Willey's metal for those who manufacture their own tools.

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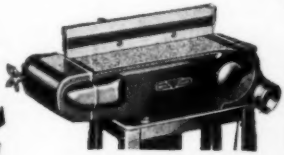
Finishing Machines

*One manufacturer stepped up production 600%!

This Delta 6" belt-type Abrasive Finishing Machine is heavy and husky enough to handle any of the dozens of sanding and polishing operations around the shop—and yet is portable enough to be moved just where it is needed. Die-casters, use it as a finishing and polishing machine, with a great saving in power cost over larger machines. Ideal for finishing, finning and surfacing plastic parts. Many shops have used this unit to make up special machines at a great saving.

HAS MANY UNUSUAL FEATURES



Entire machine is enclosed—except portion of belt being used. Thoroughly guarded—and guard can be removed instantly when necessary. Double-seal bearings, lubricated at the factory for life. No rubber covering required on drums, thus eliminating one source of replacement expense. Adjustable deflector on drum hood catches practically all dust. Hood is provided with suction spout, may be set horizontally, as shown above and equipped with wood fence for edge or face sanding, if required. Or it may be used vertically, in connection with the 7½"x14¾" tilting table as shown to the right. Cloth backed belts, 6" wide by 48⅜₁₆" long. Aluminum-oxide belts for metal finishing. Adjustable fence for edge sanding and adjustable back stop for flat sanding are available for use in horizontal positions. Send coupon for full details!

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Threading Behind on Lead: Leave more on the chaser face—more over center on your micrometer reading.

Taper Thread: Check the lead or alignment of the die.

Thin First Thread: Check the starting of the die or tap on the work, and alignment.

Safety in Lathe Operation

By Ernest W. Fair

Reducing accidents on lathes means less spoilage of work, longer life for machines, lower machine maintenance costs and fewer personal injuries to operators. All of these desirable factors merit continuous consideration of accident prevention by lathe operators. Here are a number of pointers gathered from veteran machine operators:

1—A frequent cause of accidents is a tool that has become loose in the tool post. When setting a tool, be sure to clamp it lightly until it is set in the right position and then pull clamping screws down hard.

2—Bolts which restrain compound rest from swiveling become loose, owing to vibration of machine. When this happens the compound will turn around, because of pressure of tool on the work, and considerable damage to work or machine may result.

3—Chuck jaws should be checked and double checked to make sure they are tight before machine is started.

4—Never run carriage against face plate or chuck as it may wreck the lathe beyond repair. This happens when work goes against the chuck or face plate.

5—Always keep tail-stock center well lubricated.

6—Never feed tool toward tail stock or do it only when absolutely necessary and then take only light cuts. Pressure of tool against the work throws a heavy load on the tail-stock center, and since the center is stationary and the work is turning on it, a great amount of friction results.

7—Before attempting to chase a thread, the clutch lever which controls feed mechanism should always be placed in the neutral position.

8—Oil the lathe frequently and

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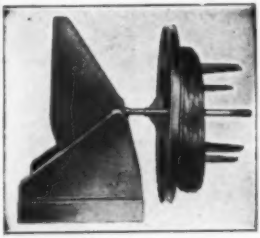

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TO AVOID SHUTDOWNS!
TO SPEED PRODUCTION!

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* ONE MAN LOADING * 300 POUND CAPACITY * SNARLPROOF
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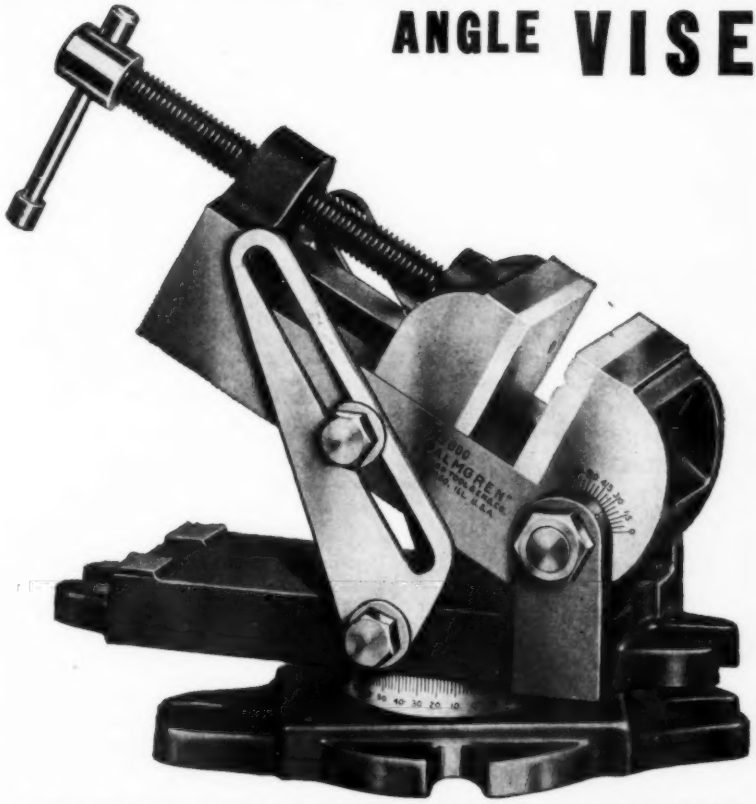

TOUGH ANGLE JOBS ARE EASY WITH PALMGREN ANGLE VISES

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CHICAGO TOOL & ENGINEERING CO.

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thoroughly; and never overlook the many holes that are hard to find. When oiling follow one rule—look for an oil hole wherever there is a moving part.

9—Lead screw and cross-feed screws must be oiled, not only in the bearings but on the threads themselves; many operators overlook this point.

10—Never drop or place any work or tools on lathe bed.

11—Don't hammer directly or indirectly on ways.

12—Smooth down any nicks that may occur on lathe bed—don't allow them to stay unsmoothed.

13—Check the lathe bed regularly; be sure it is kept leveled up.

14—Always be sure the shoulder and threads are clean and well oiled before screwing on face plate or chuck.

15—Always seek to avoid bumping threads or the shoulder.

16—Don't run a chuck or face plate up to the shoulder suddenly; this will strain spindle and threads and make removal extremely difficult.

17—Use a smooth flat file to remove any bumps on the shoulder, and a smooth three-cornered file for the threads.

18—Don't attempt to force jaws in wrong slots. Be sure that the number on the jaw corresponds with the number on the body below the slot.

19—Make sure that the threads and shoulder of the face plate are free from dirt and are well oiled.

20—Don't throw on the power until you have revolved the spindle by hand.

21—Watch your fingers; particularly keep them from getting caught between the work and the tool or in exposed gearing.

22—Never leave the wrench in your chuck when you start up machine.

23—Watch your clothing—many serious accidents result from getting clothing caught in work or lathe dog.

24—Don't use an ordinary screw driver to take out a machine screw.

25—Filing work which is held in the chuck should always be done while holding the file in the left hand.

Brazing Technique for Carbide Tools

With the tremendous increases in usage of cemented carbide tools for defense production, many manufacturers are beginning to produce their own cutting tools by brazing standard tips to shanks milled in their own tool departments. To assist such manufacturers, this torch brazing procedure is being recommended by the Carboloy Company, Inc.:

A "sandwich" braze as shown in Fig. 1, should be used for tools with tips of ¾" or more, and also for irregularly shaped tips. This type of braze differs from the ordinary braze, illustrated in Fig. 2, mainly in that a constantan sheet is inserted between double layers of Easy-Flo No. 3 and Handy-Flux.

The "sandwich" braze is also recommended when tools are produced from tips of such grades as 999, or 831, or 78, regardless of the tip size used.

In applying heat, the torch should be adjusted as shown in Fig. 3 to avoid oxidation. To assure uniformity

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NOPAK Valves save you money, too, because they are leakproof and wearproof — actually improve with use, require no maintenance. If you are not familiar with the famous NOPAK Rotating Disc Principle, write for literature at once.

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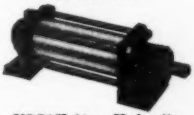
NOPAK 3- and 4-Way Hand Operated Control Valve

NOPAK Shut-off Valve Quick or Throttling Action

NOPAK Type R Foot Operated 3- and 4-Way Control Valve



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Because specifications for NOPAK Air or Hydraulic Cylinders vary with every order it is impossible to carry finished cylinders in stock. However, it is usually possible to ship *standard brass tubing cylinders*, in ordinary sizes, within two weeks from date of order.

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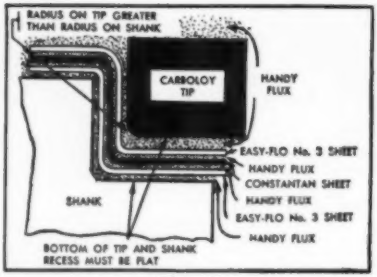

Fig. 1

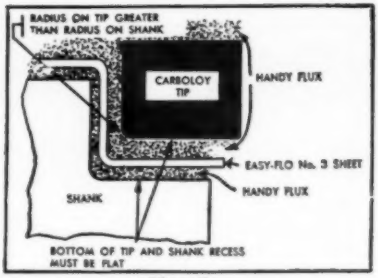
RADIUS ON TIP GREATER THAN RADIUS ON SHANK
CARBOLOY TIP
HANDY FLUX
EASY-FLO No. 3 SHEET
HANDY FLUX
SHANK
BOTTOM OF TIP AND SHANK RECESS MUST BE FLAT

Fig. 2

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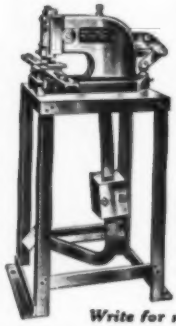
METAL-WORKING MACHINERY and HAND TOOLS
for LONG LIFE and ACCURACY



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Low-cost, toggle-action machines, adaptable to many light production and jobbing operations requiring punching or forming. Capacity, 2" hole in 16 ga. iron, 100 holes per minute or better. Four sizes, 7", 10", 18", and 24" throat depth.

Write for new Catalog No. 14.

WHITNEY METAL TOOL COMPANY
506 FORBES STREET • ROCKFORD, ILLINOIS

of heat distribution beneath the tip, the torch should be applied as shown in Fig. 4, until the Easy-Flo No. 3 is molten, flows freely, and wets the tip. The flame should be kept moving back and forth to avoid burning the steel. The tip should be held in place with a steel rod for a short period to allow braze to set, Fig. 5.

When brazing shanks ¾" square or larger, it is desirable to equalize the temperature by preheating the shank. This is best done by applying the flame to bottom and sides of shank and finally to tip to complete the braze.

When it is necessary due to tip location to fill in crevices or build up a brazed backing on the back side of tip, this work should be done during the brazing cycle—by applying torch on top of tip, using Easy-Flo No. 3 rod.

Due to difference in the rate of contraction between cemented carbides and steel, it is necessary to cool the tool slowly to avoid cracking the tip. This may be done by burying it in powdered charcoal, graphite, asbestos, mica, or lime. Tools should never be cooled by quenching.

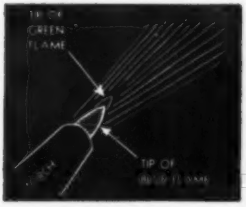


Fig. 3

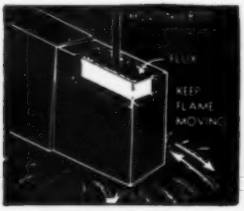


Fig. 4

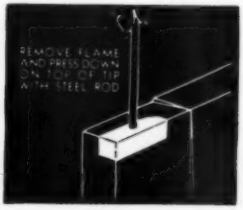
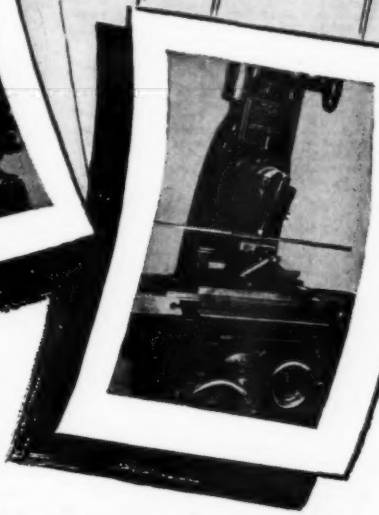


Fig. 5

The New LIBERTY

VERTICAL HIGH SPEED GRINDING ATTACHMENT



These attachments are designed for quick simplified setups for best results in tool room and are excellent for grinding gages, angles, slots recesses, and surfaces which are either impossible to get at with a large wheel or require difficult and long, expensive setups in which small wheels are a necessity.

Designed for the most accurate service in grinding tools, gages, dies and mechanical equipment and having the widest imaginable variety of applications of which those shown above are but a few.

SEND FOR CIRCULAR GIVING FULL DETAILS.

LIBERTY TOOL AND GAGE WORKS

235 GEORGE AVE. PROVIDENCE, R. I.

Tapping Trouble?

CHECK THESE POINTS

If your taps are breaking, or not cutting smooth, proper size threads, it may not be the taps' fault. Here are a few things to check to help you locate and correct tap trouble

TYPE OF HOLES TO BE TAPPED

If a blind hole, is there sufficient untapped space at the bottom for the accumulation of chips?
Is a "Gun" tap that shoots the chips ahead being used? (In a *blind* hole tapped very nearly to the bottom and having no recess, the "Gun" tap is not recommended.)
Do conditions call for a two or three fluted tap?

CLASS OF FIT REQUIRED

If the tap produces an oversize hole, has the proper tap been selected for the class of fit desired?
If proper tap is being used, is there any play in the work or tap holding spindles (provided rigid spindles are being used)?
Do the work and tap line up accurately?
Is the tap dull?

TYPE OF MACHINE

Is drive uneven because of slipping belts?
Is machine powered properly?
Are tap and drilled hole in alignment?
Is there undue wear on sliding parts?

TAPPING SPEEDS

Is the speed too slow?
Is the speed too fast?

TAPPING DIFFERENT MATERIALS

Has the tap proper cutting face for the particular material being tapped?
Is the tap of the proper design or type?

This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

PROPER HOLE SIZES BEFORE TAPPING

Is the drilled hole of the proper size?
Is the drilled hole perfectly round?
Is the axis of the hole parallel to the axis of the tap?

LUBRICATION

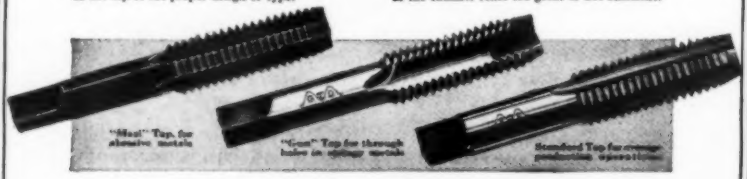
Has the proper lubricant been employed?
Does the lubricant flood the tap sufficiently while engaged in the hole?
Is there sufficient force behind the lubricant to wash away the chips?
If applied with a brush has the lubricant a sufficiently heavy body to adhere to the tap? (A light lubricant will be thrown off the revolving tap before it enters the hole.)

TAP HOLDING DEVICE

Is worn or wrong type of holder being used?
Is holder in alignment with drilled hole?

CHAMFER

Is the point diameter of tap correct for the size of hole being tapped? Does the tap enter the hole an excessive number of threads before taking hold, thereby losing the full benefit of the entire chamfered portion?
Is the chamfer the correct length?
Is the chamfer chipped or dull and in need of regrinding?
Is the chamfer relief too great or not sufficient?


"Hand" Tap for abrasive metals
"Gun" Tap for through holes in stringy metals
Standard Tap for average production operations

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In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

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What's New in the Industry

Crossed-Axis Shaving for Large Gears

A NEW line of gear finishing machines making available the crossed-axis principle of gear shaving for large gears is announced by Michigan Tool Co., Detroit. The new line includes three sizes, the largest capable of finishing gears up to 4 ft. in diameter and 20" face width. This machine (Fig. 1) is said to be the largest ever built for gear shaving and is already in actual production in a plant engaged in defense work.

By adapting the crossed-axis shaving principle to the finishing of large gears such as used in speed reducers for ships and large power plants, quietness, accuracy and service life can now be made comparable to those of smaller gears, for which the process has been available for some time.

Initiated in the automotive industry, this process is now used by aircraft engine manufacturers, machine tool producers and a host of other industries —for mass production and job lot manufacture.

The three new sizes of machines are capable of finishing gears up to 24, 36 and 48" respectively, and are designated as the 862-24, 862-36 and 865-48 respectively. The minimum size of gear that can be shaved is 1" for the 862-24, 2" for the 862-36, and 4" for the 865-48.

In the smaller machines, a total of 4 spindle speeds is provided, ranging from 109 to 313 r. p. m. Feeds in the smaller machines range from 0.314" per minute to 9.485" per minute in 12 steps. In the largest machine, the range is from 0.45 to 7.2" per minute in 6 steps. Although the distance between centers of the 24" is 36", and for the 36" machine is 48", longer centers can be supplied on special order. Although

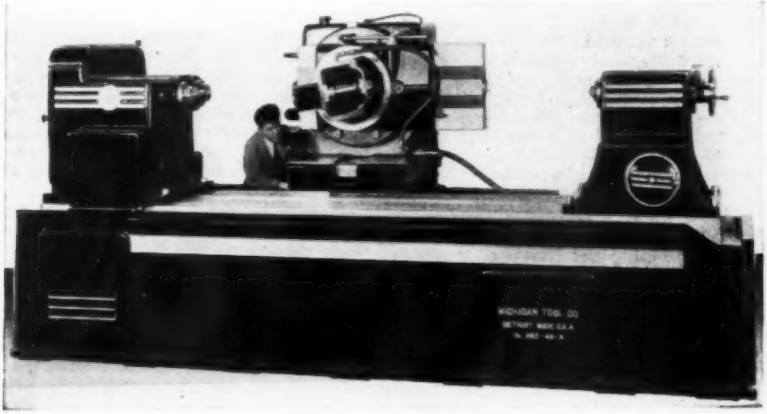

Fig. 1—The makers say this is the largest machine ever built for finishing gears by the crossed-axis shaving principle. It is capable of finishing gears up to 4 feet in diameter and 20" face width.

for most shaving operations a work speed of 300 ft. per minute is recommended, the machines are capable of operating at from 100 to 400 ft. per minute for gear diameters within their capacities.

In the 24 and 36" sizes the method of operation is by cutter reciprocation i.e., the cutter is power driven and the work "follows." The work is reciprocated axially during cutting cycle, while cutters are fed radially into work. Operation of speeds and feeds is mechanical.

The largest machine utilizes the principle of rotating the work in engagement with shaving cutter. Cutter "follows" across face of gear at predetermined speed. One of the illustrations shows a closeup of cutter spindle and vernier indexing scales for determining correct crossed-axis angle of cutter. Two optional methods of finishing the gear are available:—In the first, the cutter slide may reciprocally translate parallel to work axis. At each end of translation cutter is fed toward work until a limit is reached. Then cutter travels a predetermined number of translations before automatically terminating the cycle. With the internal attachment, this method is also used, except that feed is reversed. In the second method, the cutter slide is set in a vertical position, in which case a complete cycle consists of one translation of cutter and return at right angle to work axis. For this method, a number of feed and finishing translations can be obtained in the same manner as with the first method. The second method of feeding may also be obtained on the smaller machines at extra cost.

Control of the largest machine throughout its operating cycles is entirely electrical. The machine column shown in another view, is equipped with red, amber and white lights to indicate various circuit conditions existing during operation. The red and amber lights are controlled by limit switches. The white "work" light indicates when power is connected but turned off during automatic cycle of operation. The operating cycle can be terminated at any time by pushing a

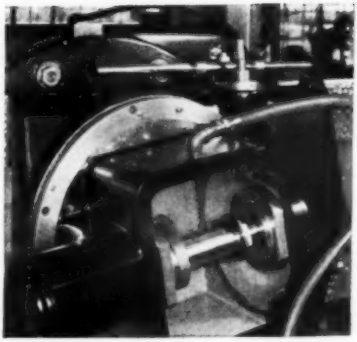

Fig. 2—Close-up of the 865-48 gear finishing machine showing cutter spindle and vernier indexing scales for determining correct angle of the crossed-axis gear shaving cutter.

"Stop" button. In the largest machine, selector switches determine direction of rotation of work. A "Jog" button permits "inching" the work drive motor in the forward direction for the set-up process. Full overload and under-voltage protection is provided by an interlock and several thermal switches. Control panel is mounted near machine, with one rigid and one flexible conduit coupling the two.

An idea of the massive size and proportions of the new 48" machine is indicated by its overall bed length of 176", a height of 74" over spindle drive head and height of 78" over cutter head. From operator's control position at "back" of machine to front of bed measures 119".

As may be noted from Figure 1, the machine is equipped with two sets of work centers having a maximum distance between them of 97". Work weighing more than 2500 lb. can be supported between the larger of two pairs of centers. Thus the machine can handle a gear mounted on its shaft, thereby eliminating possible errors in cencentricity due to mounting.

Cone-Drive units are embodied in the design of all machines. In the 24 and 36" machines, one unit is used. In the 48", three are employed in the various gear trains for feed and work

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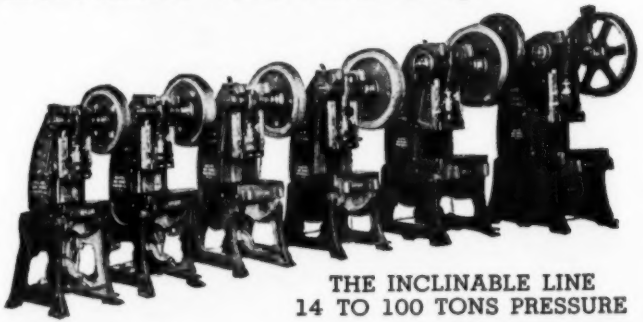
With Built-up Tie Rod Frames and Every Modern Feature—



THE INCLINABLE LINE
14 TO 100 TONS PRESSURE

DIMENSIONS	1R	2R	3R	4R	5R	5½R	6R	7R	8R
Diameter of crankshaft at bearings and crankpin	1⅛-2¾"	2¼-3½"	2½-3¾"	3-4½"	3½-5¼"	4-5¼"	4-6"	4½-6¾"	5-7½"
Standard stroke of slide	2"	2"	2"	3"	3"	3"	3"	4"	4"
Maximum stroke of slide	4"	5"	6"	6"	7"	7"	8"	8"	10"
Area top of bolster, F to B by R to L	9½x16½"	12x19"	13x22"	14x26"	18x32"	18x32"	21x34"	24x41"	27x45"
Approximate weight Fly Wheel Press	1275	1890	2900	4500	7600	7700	9700	18500	24000
Approximate weight Single Geared Press	1350	2100	3400	5100	8750	8900	10700	20000	25600
Tons pressure (rated)	14	20	26	37	50	56	65	85	100

ROCKFORD IRON WORKS, INC. 656 RACE STREET ROCKFORD, ILL.

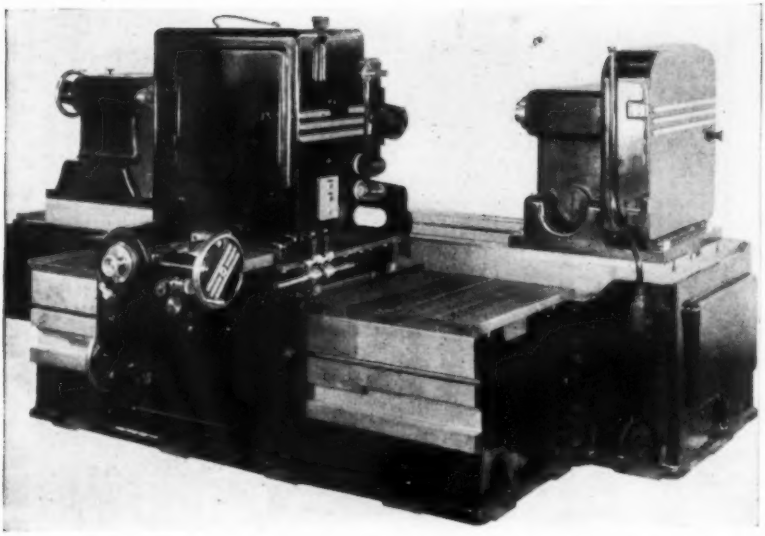


Fig. 3—The column of the 865-48 gear finishing machine is equipped with colored lights to indicate various circuit conditions during operation. Control of machine is entirely electrical.

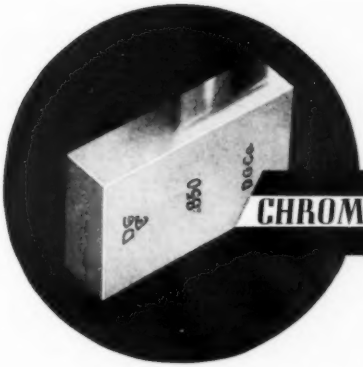
rotation. In the 24 and 36" machines, both cutter drive and feed are operated by a single motor. In the 48" size, a motor is used for main work drive and another for feed. The work drive employs two Cone-Drive units of 4-5/6 to 1 and 15 to 1 for the small and large work spindles respectively. These units and suitable change gears are mounted in spindle drive head (left side of Fig. 1) and combined with a variable speed reversible d. c. motor, provide all forward and reverse speeds ranging from 40 to 375 r.p.m. for the small spindle and from 7 to 44 r.p.m. for the large spindle. Electric controls for d. c. operation are mounted on a separate panel placed near machine. When a. c. operation is desired electrical controls are mounted within base. With an a. c. constant speed motor, 3 speeds for large spindle and 4 for small spindle are provided.

Builders No. 1A Gun Barrel Drilling and Reaming Machine

This is a double spindle machine arranged for deep hole drilling from the solid. Machine can also be used for either draw type or push type reaming and boring, the machine being furnished with a wide enough range of speeds and feeds.

Both spindles are driven from a 3 h. p., 900 r. p. m. motor in base below headstock, transmitting power through Vee-belt and gears to roller bearing headstock which carries a four-jaw independent chuck for holding barrel.

The barrel, secured in the four-jaw chuck, is supported in steady rests adjustable along ways of machine and in the barrel support and drill guide member shown at center of machine. The D-type deep hole drill is fastened in a chuck in machine carriage, supported in tool bar support adjustable along the ways, and guided into work



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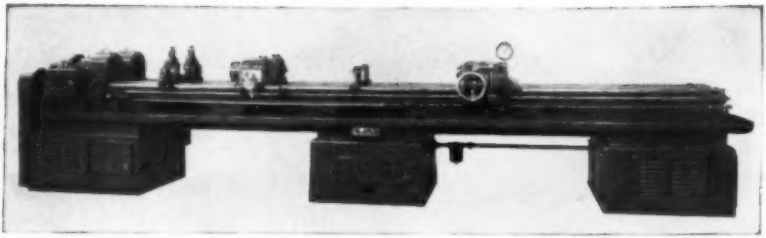
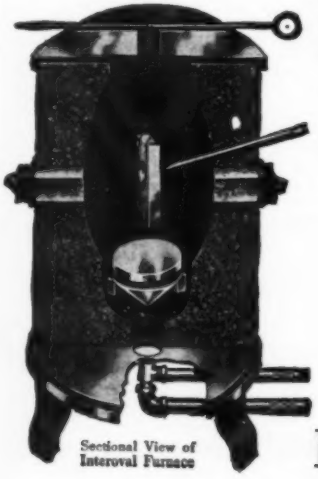


through a drill guide bushing in work support member.

A torque overload protective device is mounted on carriage and can be set to trip when any predetermined torque on drill is reached, thus protecting drills against breakage when hard spots or other drilling difficulties are encountered. Torque release operates a limit switch, stopping motor and simultaneously releasing a clutch to disengage leadscrew, preventing any further motion of carriage.

Oil is pumped from reservoir in center leg of machine, through a magnetic type filter designed to remove small particles from the oil, through oil piping into carriage of machine and then through drill shank and to the cutting edge of drill. Two pumps located in leg of machine at carriage end are each driven by a 5 h. p., 1800 r. p. m. direct-connected motor. Pump capacity is 10 g. p. m. at 700 lbs. per square inch pressure.

Machine gives 6 spindle speeds from 175 to 1,090 r. p. m. inclusive, and can be arranged for any specified speed



Sectional View of Interoval Furnace

INTEROVAL HEAT TREATING FURNACES

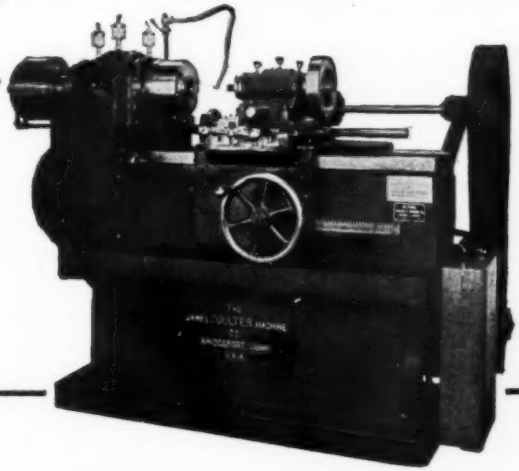
- WIRE SUSPENSION. Pieces are suspended by means of a wire attached, and heated entirely by radiation.
- HEATING CHAMBER of cylindrical oval shape, so that products of combustion do not contact pieces being treated.
- DEFLECTOR at base deflects flame upward, close to concave walls, and releases them through upper opening. The flame seals the top against entrance of air, yet enables operator to make observations.
- PYROMETER placed so fire end is closest to piece being treated, providing accurate determination of work temperatures.

For detailed information concerning this furnace write for folder.

Bennett INSURED STEEL TREATING CO.

130 SOUTH ST. — NEWARK, N. J.

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James **COULTER** *Machine Co.*

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SUTTON COLLETS

for Lathes and Milling Machines

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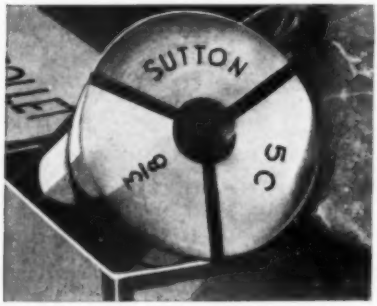
MADE from selected alloy steel. Expertly heat-treated to correct spring temper to resist wear and provide a grip with a strong come-back . . . . Precision ground inside and out to insure accuracy of taper and concentricity of hole . . . . Delivered wrapped in rust-proof paper and individually boxed and labeled.



● **Listed for all machines in complete Sutton Catalog that will also show you Sutton DIAMOND-GRIP Collets for screw machines. Ask for a copy.**

SUTTON TOOL COMPANY

2895 W. Grand Blvd., Detroit, Mich.

Accessories for Screw Machines

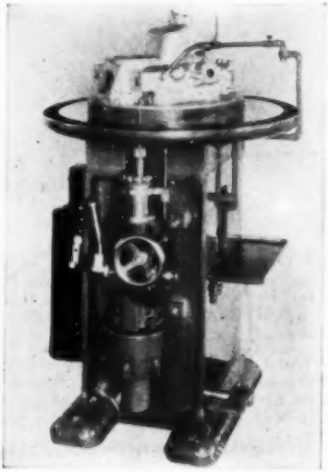
desired. There are two feed ranges, one for drilling and one for reaming. The drilling range comprises 11 feeds from .0005" per revolution to .003" per revolution, inclusive. The reaming range is 10 times the drilling range.

Bore capacity is 1.5" maximum, .5" minimum. Length is 84" maximum, stroke 144"; swing 10½"; chuck 10" 4-jaw Independent.

This machine is built by Builders Iron Foundry, 21 Codding St., Providence, R. I.

Back Spot Facing Machine

Currently announced by Taft-Peirce Mfg. Co., Woonsocket, R. I. is a new machine designed for counterboring or facing bosses through which a hole has been drilled but which, because of an obstruction, it is impossible to counterbore on a drill press.



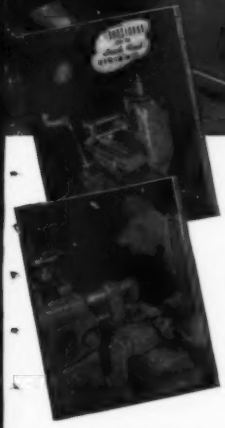
The part to be machined is mounted on a substantial cast-iron table. Near front of table is a hole to allow shank of the inverted counterbore to project through the table. The cutter is driven by a spindle just under the table, the spindle and driving mechanism being of ball-bearing construction and driven through bevel gears by a ½

Number 00 Rigidmi
Speeds Shell Productio

Top speed on milling staking notche in shell-bodies is maintained easil by the operator of the standard Sund strand Number 00 Hand-feed Rigidmi illustrated. Fixture is special, quick acting, easy to operate, has automati stop after last index. A wide range o shell-sizes . . . or other ordnance parts . . . or work-pieces for civilian com merce, can be milled fast and eco nomically on this same Number 0 Rigidmil, using other suitable fixtures

Standard Number 00 Hydraulic Rigid mils, with Sundstrand hydraulic oper ating equipment climb-cut and con ventional-mill in automatic cycles controlled by easily adjusted dogs Quickly-trained operators easily run two or more machines apiece and ge out amazing quantities of long- and short-run precision milling.

Sundstrand Rigidmils are built in many other combinations of table width lengths and feed strokes; and with work capacities ranging from ¾ to 30 H.P.



Write for These Bulletins

Complete data on Number 00 Hand Feed Rigidmil is contained in Bulletin *H-00-1.* Interesting additional information on Number 00 Hydraulic Rigidmil is in Bulletin *P-00-1.* Write, *today,* for these Bulletins. Send drawings and data on your milling operations for Engineered Production estimates.

Sundstrand Machine Tool Co.

2535 Eleventh Street, Rockford, Illinois, U. S. A.

SUNDSTRAND MACHINE TOOL CO. S ROCKFORD, ILLINOIS

RIGIDMILS • STUB LATHES

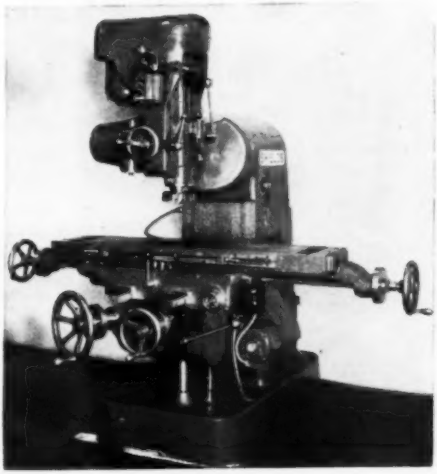
Drilling and Centering Machines • Hydraulic Operating Equipmen

h. p. motor mounted inside base. Change pulleys provide speeds of 170 r. p. m. for steel and 300 r. p. m. for aluminum alloys.

Spindle feed is by hand, either through a worm and worm-wheel, or direct by means of a rack and pinion. Spindle is counterbalanced, and power can be disengaged by a clutch so as to rotate spindle freely by hand if operator so desires.

Maximum diameter of table is 31½"; working surface is 28" in diameter. Height floor to table top is 37". Floor space required is approximately 34"x 32". Drive is by single Vee belt. Spindle has No. 2 Morse Taper. Pump is a No. 11 Brown & Sharpe and clutch is a No. 2 Johnson. Shipping weight is approximately 1200 lbs.

Shields No. 3 Vari-Angle Milling Machine



A versatile heavy duty vari-angle milling machine has been developed by Shields Mfg. Co., Inc., 38-09 24th St., Long Island City, N. Y.

Column, knee and table are of standard design. A variable speed gear built into the knee permits instantaneous change of table feed. Rapid traverse and directional control are provided for. Upper part of column contains a large bore for reception of swivel drum. Attached to swivel drum is a worm wheel of large diameter, meshing with a worm mounted on ball bearings inside column. Swivel is securely clamped in any position by means of a large diameter flange. A locking drum fits over flange and is locked by means of a single large nut. To change angular direction of spindle in a longitudinal direction, locking nut is loosened and head may be swung into new position by turning worm handle. Direct reading dials indicate position of head at any angle.

Design of the cross swivel mechanism and procedure for angular cross set-

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These files are available in a number of different styles and sizes, in either High Carbon Steel or High Speed Steel.

Send for catalog showing a wide variety of standard shapes and special shapes. Perhaps we have what you want in stock, if not, we can grind it.

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If you have need for special shape Files, we shall be glad to submit the desired File for your approval and trial upon receipt of a sample or sketch.

This service is designed especially for your convenience, for which we make no charge.

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"Keep 'em flying — keep 'em firing!" Once again that famous name "Revere" plays an important part in an America at war. This time it's a modern, behind-the-lines role as Revere Copper and Brass Incorporated piles out the shell parts for Uncle Sam. The accurate rotating bands that guide the shells are among the important shell parts made by Revere.

Photo by U. S. Army Signal Corps

In Revere's Rome, N.Y. tool room, the Atlas Shaper makes snap gauges, small tools, and commutator dies.

With America at war, our vital problem is complete efficiency for top production. Use Atlas tools for small precision parts — keep larger machines on the operations they can handle best.

Atlas
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ATLAS PRESS COMPANY

150 N. PITCHER ST., KALAMAZOO, MICH.

LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES

ting are similar.

A 4-position turret stop is provided for step milling and drilling.

Specifications:—Table Working Surface, 64"x16"; Feed (infinitely variable) ½" to 12" per min.

Range—Longitudinal (power) is 34"; Cross Travel (power) 12"; Vertical (power) 16".

8 Standard spindle speeds (r.p.m.) are provided, viz., 72, 125, 226, 320, 360, 635, 1130, 1630.

Swivel Movement — Longitudinal to table is 180°; cross table (each side) 40°.

Motors, Head (Reversing) 3 h.p. 1200 r.p.m.; Feed and rapid traverse motor 1 h.p. 1750 r.p.m. and Pump Motor ¼ h.p. 1750 r.p.m. Floor Space required is 8'x6'6".

Finishing Engine Cylinders

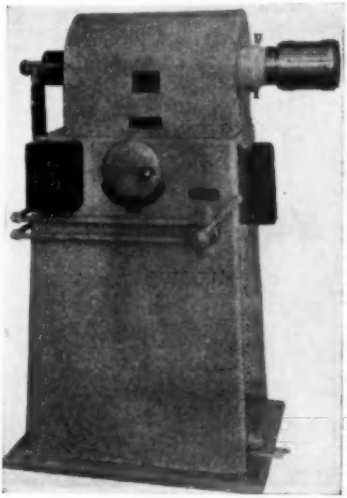
Designed especially for polishing and finishing cylinders for aircraft engines, this new type variable speed lathe is equipped with an expanding mandrel for holding the work.

Mandrel is air operated. Control is by means of hand air valve, which, if desirable, can be replaced by foot control.

Any spindle speed desired—from a low of 105 r. p. m. to a high of 1155 r. p. m.—is available while running.

Power is supplied by a two-speed. ½ h. p., 875-1750 r. p. m. standard NEMA frame motor.

The assembly includes an exclusive, automatic brake that applies when the treadle is depressed to open the motor circuit.



This type of lathe can be supplied with single or two-speed motor, allowing infinite selection of spindle speeds between 25 and 4000 r. p. m., in a ratio of 5½ to 1 single-speed, and 11 to 1 with a two-speed motor. Can be also be supplied with 3 or 4-jaw chuck, or special holding device to meet individual requirements.

It is made by the Schauer Machine Co., 2064 Reading Road, Cincinnati, Ohio.

NEW TAYLOR
"Hi-Duty" Drilling Machine

NEW Taylor "HI-DUTY" Moderately Priced. Model F-400 Production Drilling Machine Capacity 1/32" to 1/2"

Many Outstanding Features
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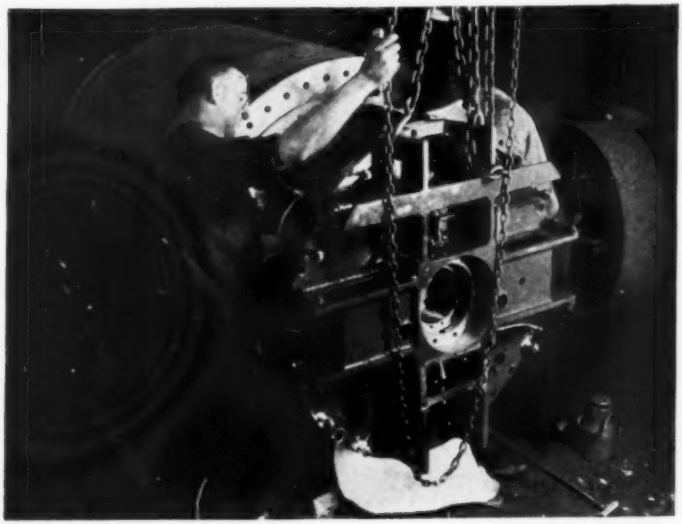
Only through such an institution can supply and demand be adjusted to the *known needs* of producers —
as only the local Distributor knows them.

THE ALLEN MANUFACTURING COMPANY

HARTFORD, CONNECTICUT, U. S. A.

Induction Heating Speeds Production of Machine Parts



The demand for greater speed in forming and treating steel machine parts has more than doubled the production of high frequency, inductive heating generators, according to J. B. Walker, Manager of the Westinghouse transportation and generator division.

With inductive heating it is possible to harden steel surfaces to any desired depth and width. A shaft can be given hardness at points where it must resist wear without destroying the toughness of the whole piece. This is important because most methods of heat hardening tend to make steel wear resistant but brittle.

In addition to being an excellent method of hardening the parts of machines that must withstand wear, such as the bearing surfaces of an automobile crankshaft or cylinder wall, induction heating is also used for softening steel so that it may be rolled or pounded into shape.

Now being built big enough to merit hydrogen-cooling, one of the largest

LATHE STOP $15.00

PRICES GO DOWN ON QUADRUPLEXES

The Quadruplex Lathe Stop and Turret Tailstock help ease the production load by their multiple operations. Low cost, universal adaptibility and ease of attachment make **QUADRUPLEXES** a **"MUST"** on all lathes.

F.O.B. BLOOMFIELD, N. J.

IMMEDIATE DELIVERY FROM STOCK

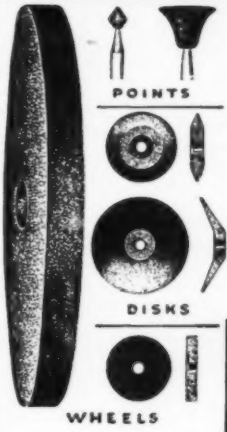
TURRET TAILSTOCK $15.00

Dept. B 1 SPECIALTIES MANUFACTURING COMPANY INC.

35 FARRAND STREET, BLOOMFIELD, N. J.

SPEED-UP YOUR PRODUCTION WITH THESE *Super Quality* S. S. WHITE TOOLS!

ABRASIVE TOOLS



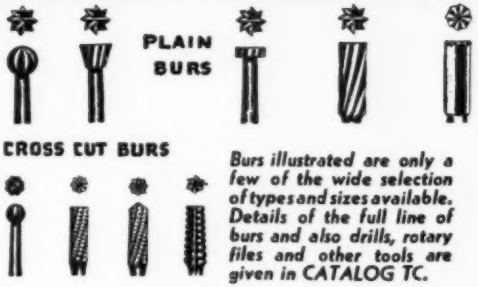
Available in a wide variety of shapes and sizes in "S.S.WHITE" brand (Silicon Carbide) for soft materials, and in "GEM" brand (Aluminum Oxide) for harder materials. Details in CATALOG TC.

S. S. WHITE offers a comprehensive line of small cutting and grinding tools of which a representative few are shown at the left and below. These tools are made of the best materials, and constructed with a high degree of accuracy by methods and equipment perfected through 50 years of continuous manufacturing. As a result they cut fast, clean and true and hold their cutting edges for long periods—the reasons why they help speed up production.

WRITE FOR CATALOG TC

It illustrates and gives full details about the complete line. A copy—with price list—will be mailed at your request. Write for it.

STEEL BURS, DRILLS, ROTARY FILES



Burs illustrated are only a few of the wide selection of types and sizes available. Details of the full line of burs and also drills, rotary files and other tools are given in CATALOG TC.

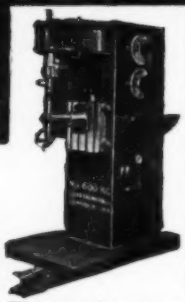
S. S. WHITE

The S. S. White Dental Mfg. Co.
INDUSTRIAL DIVISION
Dept. H, 10 East 40th St., New York, N. Y.

FLEXIBLE SHAFTS for **POWER DRIVES, REMOTE CONTROL** and **COUPLING**

SOLVED!

Your WELDING PROBLEM



We manufacture a complete line of ELECTRIC SPOT WELDERS from ¼ to 500 K. V. A. for welding:

- Brass
- Aluminum
- Bronze
- Stainless Steel
- Galvanized Sheets
- Monel
- Molybdenum
- Tantalum
- Nichrome
- Tin Plate
- Copper
- Nickel
- Silver
- Gold, etc.

There is an EISLER WELDER for every purpose.

Butt Welders to weld from .010" to ½" dia. metal. We make all kinds of Standard & Special TRANSFORMERS A. C. ARC WELDERS—100 to 400 Amps. LARGE or SMALL QUANTITY CONTRACT SPOT WELDING.

FOR INFORMATION WRITE TO

CHAS. EISLER

EISLER ENGINEERING CO.

762 So. 13 St. near Avon Ave., Newark, N. J.

machines yet made was recently delivered to the Caterpillar Tractor Co. This 9,600 cycle unit consists of a 500-kw generator and an 800-h.p., 3600 r.p.m. driving motor mounted within a single housing.

The steel to be heated is placed within a coil to which the output of the high frequency generator is connected. The rapidly varying magnetic field induces eddy currents in the metal, which causes the heating. The effect is unique in that one's hand would not be affected but a piece of steel becomes hot within a few seconds when inserted in the coil.

The illustration shows assembling of center bearing bracket of induction heating set with generator visible in the background. Shoe type bearings which operate on the pivoted pad principle are used. For the small poles and air gap of a high frequency machine, the machining and alignment must be accurate to reduce unbalanced magnetic pull to a minimum. Under these conditions, the unbalanced magnetic pull is sufficient to overcome the weight of the rotor. Designed to carry a load in any radial direction, these bearings can support a much higher load than conventional bearings.

Fractional Horsepower Motors

Small motors from 1/6 to ½ h. p., 145 frame size, for general use are described in a new eight-page folder.

The standard parts making available more than 5000 combinations of type, rating, and mounting are described and illustrated. Charts show motor characteristics plotting per cent synchronous speed against per cent full load torque.

Features conducive to long motor life and low maintenance are discussed along with construction details. Thermoguard protection against overloads and excessive temperature is explained. Blackline drawings give the necessary physical and mounting dimensions.

A copy of folder F-8623 may be obtained from department 7-N-20, Westinghouse Electric & Mfg., Co., East Pittsburgh, Pa.

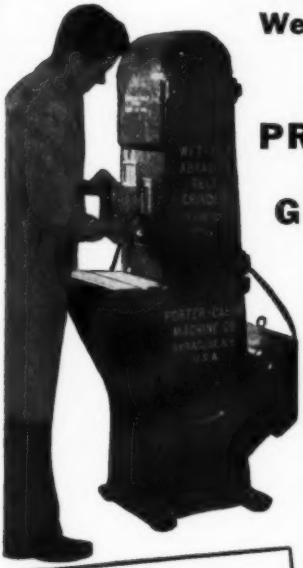
SENSATION OF TWO SHOWS!

PORTER-CABLE

Wet-Dry G-8

●

THE PRECISION BELT GRINDER



Gives Speed Plus Accuracy to Within .0005"

Cuts Production Costs

Minimizes Rejects

Does Many Precision Jobs Without Fixtures

Relieves & Supplements Major Machines

At the National Metal Show and earlier at the Tool Engineers Show, Porter-Cable G-8 proved that speedy wet belt grinding is now **precision** grinding!

Hundreds of "hard-boiled" production men crowded around our demonstration booths — wanting to be shown "belt-machining"—bringing their own samples of hard and soft metals, alloys, plastics, hard rubber —virtually **daring** us to put our machine to the test.

And we did just that! Free-hand work we held to .001"—and where they wanted **close** tolerances we held limits of .0005" or better! Heating, warping, discoloration and dust were entirely eliminated. Some jobs formerly done on millers with fixtures, we did free-hand **five to twenty times faster!**

Right now, Porter-Cable Wet-Dry Grinding is a godsend for relieving and supplementing your major machine tools. See it perform — on your own jobs. We'll demonstrate whenever convenient to you. Arrange appointment. Write us direct or phone your local Porter-Cable representative today.

5 to 20 Times Faster By Actual Demonstration

See it during **January,** *demonstrated in Milwaukee, Davenport, Rock Island, Moline, Des Moines, Kansas City, St. Louis, Springfield, Ill., Indianapolis, Dayton, O.*

For time and place, call your local Porter-Cable representative.

FREE—3rd Edition, "Wet-Dry Belt Grinding in the Spotlight," tells Where, When and How to use this new high-speed type of precision belt grinding. Write for your free copy **today!**

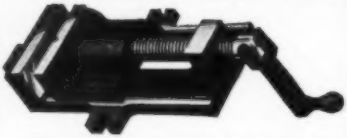
●

PORTER-CABLE MACHINE CO.

Representatives in Principal Cities in U. S. A.

300-1 Exchange St., Syracuse, N. Y.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

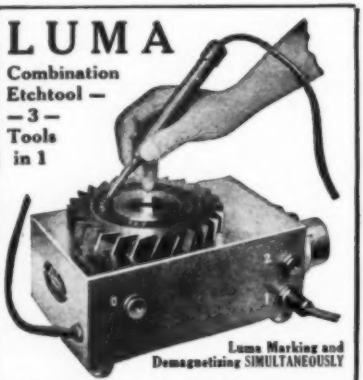
Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

LUMA

Combination Etchtool — —3— Tools in 1



Luma Marking and Demagnetizing SIMULTANEOUSLY

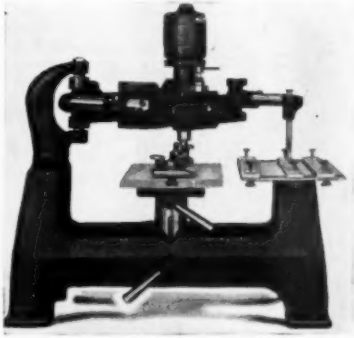
Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

Luma Electric Equipment Co.
Dept. H—Main P. O. Box 132, Toledo, Ohio

Versatile Pantographic Unit

An improved machine of pantographic type, for rotary engraving, electrical marking, and acid etching, is announced by H. P. Preis Engraving Machine Co., 157A Summit St., Newark, N. J. Separate heads, quickly interchangeable, are used for the three classes of work, and the ball-bearing-mounted pantograph provides reductions from 1.8 to 1 down to 5 to 1.



With the engraving head shown, depth of cut is controlled independently of depth of master characters, by a micrometer adjustment mechanism. Movement of cutter toward and away from work is controlled by a cam-action drop lever, independent of vertical position of tracing stylus. Cutter spindle, equipped with adjustable ball bearings, is driven by a ball-bearing motor of universal type. It is stated that this equipment produces uniformly excellent engraving on all metals, from mild steel to soft alloys, and on plastic materials, ivory, hard woods, etc.

The electrical marking head is served by a transformer with a 10-stage voltage-control switch, for selecting any desired degree of marking, from very light to very heavy. Contact of marking point with work is controlled by sensitive spring pressure, and point may be removed from its fixture for free-hand marking. The unit will mark steel of any degree of hardness and is

This ONE-PARTY POWER LINE
Ends Production Delays
• • • and Supplies
CONSTANT HIGH SPEED
For EVERY Job
EQUIPPED AS A DISC SANDER
Mall TRADE MARK FLEXIBLE SHAFT GRINDER

● No busy signals here . . . when you plug this powerful MALL Grinder into a regular electrical outlet. NO chance of other tools being hooked on to slow down your speed. NO hose to fail. NO leaks to mend. Like opening the throttle on a "Hurricane", the smooth, steady flow of power dominates the jobs ahead. Grinding, Disc, Cone and Drum Sanding, Wire Brushing, Polishing and Drilling are handled with speed and precision. Quickly interchangeable, swivel-fitted tools for each of these tasks are changed as easily as bits in a brace.

NO time is lost. The cutting life of tools is lengthened. Rejects are greatly reduced. Decisions are easily won over former costs. And, production moves on a higher level.

With all of these mechanical advantages, human effort is notably conserved. The tools are light in weight and easy to handle. The cumbersome motor weight, found in many portable power tools, rests well above the floor on a high tilting, swiveling yoke—making power available in any position. The swiveling caster-base mounting provides a high degree of mobility. These combine with other fatigue-arresting aids to inspire labor to better, faster work.

Thus, MALL Flexible Shaft Grinders enable management to fuse mobile horse power with man power and materials—at lower cost.

We'd welcome an opportunity to demonstrate this ONE-PARTY Power Line MALL Grinder in your plant AT OUR EXPENSE.

Write TODAY for full details and complete catalog of MALL Portable Industrial Equipment.

MALL TOOL COMPANY

7742 So. Chicago Ave., Chicago, Ill.

Manufacturers of over 200 gasoline engine, air and electrically operated tools and attachments.

THE HANDIEST RACK YOU EVER SAW

Greatest capacity — Smallest floor space

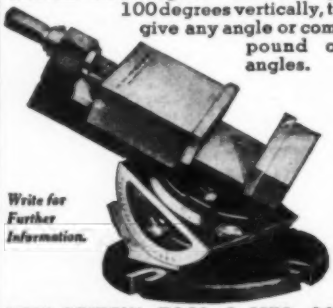
4 arms, 51" high, stacks 10,000 lbs. flat or round stock. 3 stands for 20' lengths; 2 for 12' or shorter. Use against wall or back to back in center of room. Cost is small, value big.

Write for circular and prices.

Wm. S. Yohe Supply Co.
503 Mahoning Rd. N. E., Canton, O.

New Britain UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

particularly useful where engraving and stamping are not practicable.

The acid etching head is used for cutting through an acid-resisting coating on metal or glass, in preparation for the application of the acid etching fluid. This method is widely used in marking gages, tools, and machine parts, as well as such glass objects as tubes, laboratory equipment, and optical lenses.

The copy holder comprises three or more individual slides which may be positioned independently of each other, for variable space between lines. This feature makes it possible to do, in a single set-up, many jobs which formerly required two or more set-ups.

Designed for mounting on a bench, the basic machine is a compact unit measuring 21" long, 14" wide, and 15" high. A new bulletin gives a complete description of machine and attachments.

More Power Per Pound

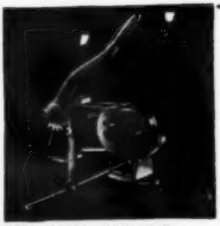
In 1936 the U. S. Army specified that a 750-watt aircraft generator weigh not more than 31 pounds. Army airplanes now require generators of 5.7 kw, (28 volts) and are getting it from a 42-pound unit developed by Westinghouse. A 750% increase in capacity with an 18% increase in weight is the measure of five years' progress and of engineering skill when the "heat is on." Specifically how this has been accomplished cannot be disclosed, except to say that advantage is taken of the new high-temperature insulations such as glass and that a greatly improved ventilating scheme is used.

THE WONDER CUTTER

Cuts wire or rod up to ⅝ inch round (⅜ inch square) and band iron up to ⅛ by 2 inches.

Adjustable stop for repeated cuts to same length. Hardened cutters last indefinitely.

Powerful leverage makes all cuts easy. Small size permits placing wherever convenient.



Small in size but a giant for work. The lowest priced rod and band cutter on the market. Every shop needs one. Hundreds in use.

You can get one for free trial in your own shop.

Write today for further details and price!

THE FEDERAL FOUNDRY SUPPLY CO.,
4602 EAST 71st STREET, CLEVELAND, OHIO

THESE *MODERN* TOOLS ARE NECESSARY

FOR INCREASED WAR PRODUCTION

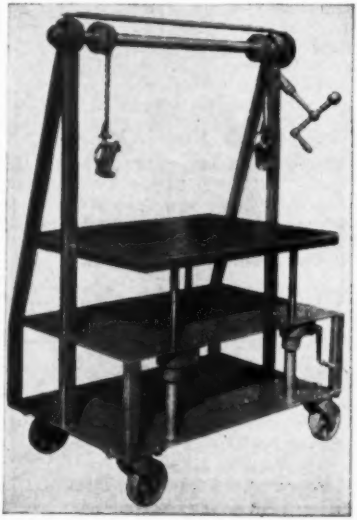
USERS OF THE EFFICIENT MODERN MOTOR DRIVE REPORT

25% SAVINGS

IN TIME OF OPERATOR AND COST OF OPERATION OF MACHINE

MODERN MOTOR DRIVES save time and money for you in three important ways: THEY ELIMINATE LINE SHAFT EXPENSE; THEY SAVE VALUABLE FLOOR SPACE; THEY SAVE POWER. At a small outlay you can provide operating economies and efficiency the equal of those secured by the installation of thousands of dollars worth of new machine tools.

For national security it is important that EVERY machine tool be MODERNized for increased production. There is a MODERN MOTOR DRIVE for all types of lathes, shapers, milling machines, punch presses, drill presses, grinders and hacksaws.



MODERN MULTI-DUTY DIE TRUCK

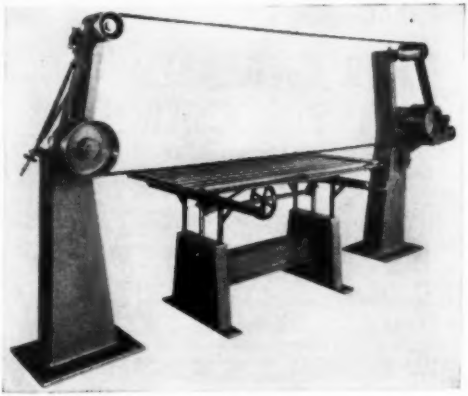
The new and improved MODERN MULTI-DUTY Die Truck combines all the features you have always demanded into one practical, economical unit.

MORE WORKING ROOM
FASTER TABLE TRAVEL
EASIER ROLLING
ADJUSTABLE TABLE
ADJUSTABLE SLIDING SPOOLS ON KEYED SHAFT
ADJUSTABLE CAST STEEL PUNCH HOLDER CLAMPS
PRACTICAL WORK BENCH
CONVENTIONAL TRUCK

MODERN MOTOR DRIVES, INC.
ELKHART, INDIANA

Jefferson Endless Belt Sander

A new endless belt sander which facilitates finishing operations on large flat, as well as concave or convex surfaces is offered by Jefferson Machine Tool Co., 700 W. Fourth St., Cincinnati, O.



The substantial table travels (36" backwards and forwards) on ball-bearing rollers and is easily moved while the operator applies pressure to the flexible belt with the block or pad. There is no cross rail between standard to obstruct vision. Overhead idlers keep the upper travel of the bolt out of the way. Belts may be quickly changed. The vertical adjustment (10" by hand wheel) of table provides for work of exceptional thickness. Standards may be spread apart to accommodate long surfaces.

Table frame is of heavy structural steel, electrically welded. Table stands 32" from floor. Heavy maple table top is 36"x80".

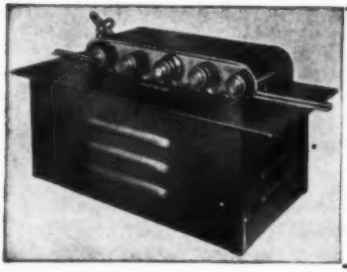
Main sand belt pulleys are 12" in diameter by 8-¾" face. The overhead idler pulleys are 6" diameter by 8-¾" face. Pulleys are accurately machined, as well as statically and dynamically balanced. Pulleys run on dust-proof ball bearings. Conveniently located hand wheel adjusting screw permits keeping belt in alignment. One idler pulley has adjustable counterbalancing spring mechanism to regulate belt tension. Drive is direct from a 2 h.p. enclosed ball bearing motor, 220 or 440 volts, 3 phase, 60 cycles.

Belt travels approximately 1800 surface feet per minute, which is the standard in metal working shops. For wood finishing, a belt speed of approximately 5,000 s.f.i. is recommended.

A new bulletin gives full details.

Small Bench Plates

Small precision ground, semi-steel bench plates, so necessary for many types of assembly, layout, and inspection operations, are now available from The Challenge Machinery Co., Grand Haven, Mich.



MAPLEWOOD "PORTABLE"

for rolling light gauge materials.

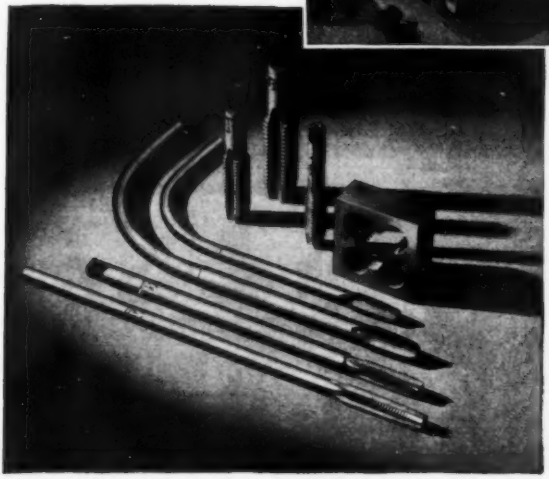
Interchangeable rolls for Pittsburgh lock, acme lock, drive cleat, right angle bend, channel or special shapes.

Write for catalogue on pipe, elbow and rolling equipment.

MAPLEWOOD MACHINERY CO.

2634 Fullerton Ave., Chicago, Ill.

IN DEFENSE PRODUCTION WITH WINTER TAPS



• Your tapping Costs will be less with WINTER QUALITY TAPS on the job. Their rapid and uniform cutting action insures smooth threads and accurate assembly fit.

Skillfully made taps for today's excessive demands.

WINTER BROTHERS CO.

MAIN FACTORY—WRENTHAM, MASS. • BRANCH FACTORY—DETROIT, MICH.

A Division of the NATIONAL TWIST DRILL & TOOL COMPANY
DETROIT, MICHIGAN

STEEL BOXES
for Handling and Storage
IMMEDIATE SHIPMENT!

TAPER PANS

No. 101— 10"x18"x6"—18 Gauge —**$.75** ea.
No. 102— 12"x20"x6"—16 Gauge —**$.90** ea.

One-piece, all-welded construction. Hook handle at each end. Will nest perfectly when empty.

SHOP BOXES—Straight Side

No. 401—10"x16"x6"—18 Gauge—**$ .85** ea.
No. 402—12"x18"x8"—16 Gauge—**$1.10** ea.

A straight side shop box with rigid handle and hook hole each end. Excellent for shop use where stacking feature is not required.

STACKING BOXES

No. 601— 10"x16"x6"—18 Gauge —**$ .95**ea.
No. 602— 12"x18"x8"—16 Gauge —**$1.25**ea.

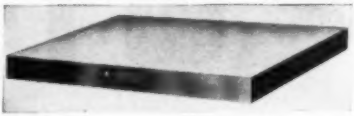
An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and re-inforce box at point of maximum wear.

Prices F.O.B. Factory, Philadelphia— Any Quantity !

Order Today—Write, Wire or Phone

AMERICAN METAL WORKS, Inc.
1518 GERMANTOWN AVE., PHILADELPHIA, PA.

These plates provide an accurate plane surface and are particularly required for inspection and assembly of small parts in aviation and automotive plants.



Challenge precision ground bench plates are made of iron and steel with all sides machined at right angles to the top surface. They are designed to provide rigidity and strength and assure a smooth, solid working surface.

Nine standard sizes—2, 4, or 6" thick —are available. Special sizes can be made to order. The manufacturer states that, at present, prompt delivery can be made on the 2" plates in sizes of 8x10, 10x14, 12x12, 12x14, 12x16, 12x18, 14x18, 16x18, and 18x18 inches.

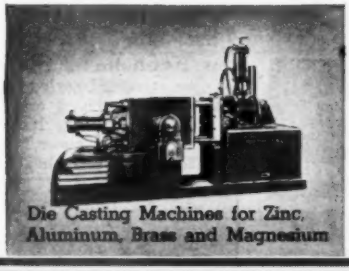
BAUMBACH

STANDARDIZED
Machined Steel **DIE SETS** Semi-Steel
Drop Forged Steel

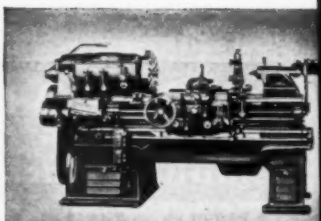
Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.
1810 So. Kilbourne Ave., CHICAGO, ILL.



Die Casting Machines for Zinc, Aluminum, Brass and Magnesium



14" — 16" Toolroom Lathes
14" — 16" — 20" Engine Lat

REED-PRENTICE MACHINE TOOLS

For

7-DAY WEEK PRODUCTION

Today's severe demands for increased production call for the ruggedness, and efficient performance of Reed-Prentice machine tools. Equipment bearing the Reed-Prentice label meets with the acceptance of government technicians and is widely used in the production of Aircraft, Army and Navy armaments and munitions. Favorable deliveries are available, detailed proposals gladly submitted—no obligations, of course.

No. 5 Jig Boring Machine also built as Vertical Miller and Die Sinker

No. 2V Router and Vertical Miller

No. 3VG Vertical Miller and Die Sinker

No. 3VGS Vertical Miller and Die Sinker

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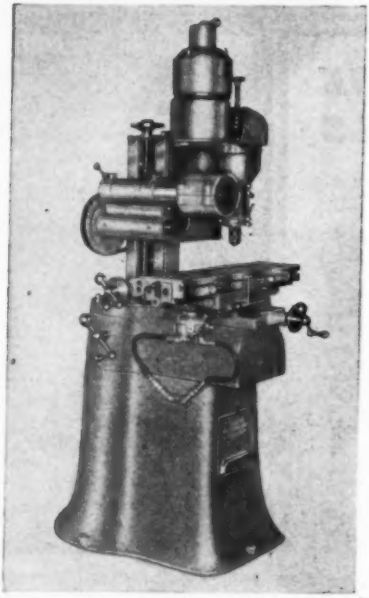
ARMOR
UNIVERSAL
Milling Machine

HYDRAULIC FEED



Note these features—

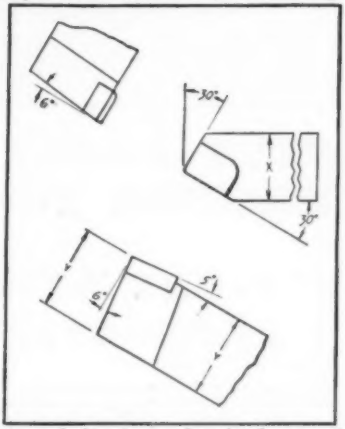
Horizontal and vertical spindles
Hydraulic feed converted to hand feed in 10 seconds.
Countless feeds ½ inch to 8 feet per minute
Turret rotates full 360°
Vertical and horizontal spindles used simultaneously for parallel cuts.

Write today for new bulletin giving full particulars.

AIRCRAFT MACHINERY
CORPORATION
Burbank . California

New Kennametal Standard Tools

A new standard series of Kennametal tools in large turning and facing styles for heavy machining has been developed by the McKenna Metals Co., 135 Lloyd Avenue, Latrobe, Pa. The position of the tip in the shank (see illustration) permits a greater thickness of steel under the cutting point of the tip, permits the top surface or chip breaker to be ground without the necessity of grinding away steel, and during the life of the tool the height of the cutting point is retained rather than being lowered each time the tool is ground.



Tools of this design are available in all turning and facing styles and in all shank sizes 1 inch and larger.

BUY DEFENSE SAVINGS BONDS

LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT

Max. cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3"x4½" in area. Leaf arm gives perfect alignment without ways or leader pins. Portable.

Ask your dealer, or write for circula

LESLIE WELDING CO.
2947 Carroll Ave. Chicago

TORIT Dust Collectors

Contribute to Modern Industry

Torit self-contained units are being used more than ever to control dust, because they pay big dividends in employee health, safety and goodwill. Torit Dust Collectors protect vital machines from abrasive dust.

HERE'S WHAT George Hedberg, General Manager of the SEVERANCE TOOL COMPANY of Saginaw, Mich. says:

"Torit Dust Collectors solved our problem of heat loss, and tests show their efficiency."

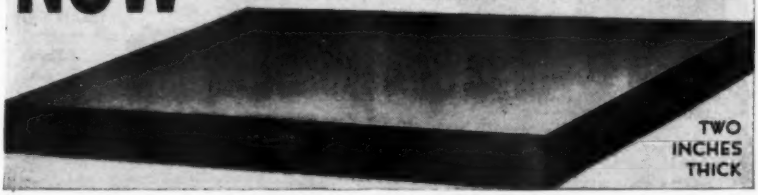
Torit Advantages:

Torit Dust Collectors are portable-may be placed conveniently near grinding wheels or other dust sources. Power consumption is lower since suction can be provided for machines only actually in use. Installation cost is less than a central system.

Send for bulletin giving complete information, specifications, and prices.

TORIT MANUFACTURING CO. **303 Walnut St. St. Paul, Minnesota**

NOW YOU CAN GET CHALLENGE SEMI-STEEL BENCH PLATES



. . . PRECISION GROUND!

These small semi-steel bench plates, precision ground to an accuracy of .0005-inch, are now available for many types of work, particularly inspection and assembly of small parts. They provide an accurate surface and are built for lasting strength and rigidity.

All four sides are machined at exact right angles to the top Challenge Precision Ground Bench Plates are made in nine standard sizes, from 8x10 to 18x18 inches. Other sizes to order. Prompt delivery on standard sizes. Ask for prices and data. 411

Challenge **THE CHALLENGE MACHINERY CO.**
GRAND HAVEN, MICHIGAN, U.S.A.

UNIVERSAL

CENTERING CHUCKS AND FLOATING CHUCKS FOR SPEED, ACCURACY

Universal floating chucks (right) are designed to operate horizontally in automatic screw machines and turret lathes. Adjustable spring pressure in 4 directions prevents dogtail motion and marred holes.

Universal centering chucks (left) make a centering machine out of a drill press. Accurate and sturdy. Depth adjustment for centers. Both floating and centering chucks available for speedy delivery. Write for catalog.

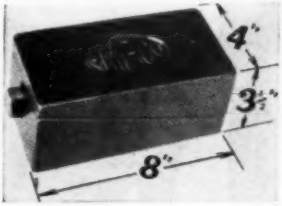
UNIVERSAL

Engineering Company

Frankenmuth, Mich.

Empco Machine Jack

Developed in their own shop to meet their requirements for accurately levelled machines on precision work, the "Empco" Machine Levelling Jack is now being offered commercially.

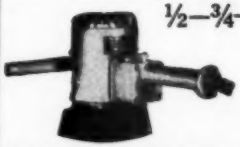


Composed of but three parts (two castings and a screw) it provides accurate and economical means of maintaining machines level.

Shipped from stock, one to a carton, weighing 26 lbs., it is manufactured by Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

CUTS GRINDING COSTS

½—¾—and MORE



HEAVY DUTY

3 Phase
60 Cycle
No Brushes

GASTON POWER TOOLS

2655 W. 95th St., Evergreen Pk. Ill.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY

1859 Gardner Ave.
Berkley, Mich.

NOW IT'S 8!

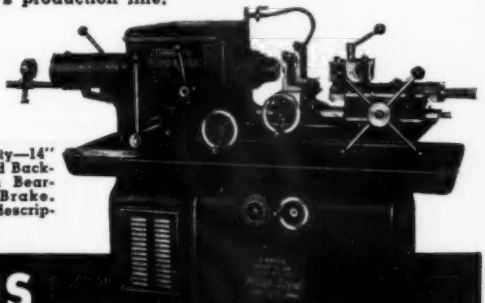
Aircraft Bushings — thousands of them — with outside diameter held to .0005 tolerance, using stock model roll tool, reamed to .001 tolerance and held to length within .005!

Swift Lubricator Company, of Elmira, N. Y., reports these figures on the top-notch performance of two Simmons No. 2 Turret Lathes purchased late last Fall.

"Very satisfactory," was their comment. And when increasing orders made it necessary to augment the battery of turret lathes, six more Simmons machines were added.

Now it's eight Simmons No. 2 Micro-Speed Turret Lathes on the Swift Lubricator Company's production line.

1,000 spindle speeds through Micro-Speed Drive, secured instantly by Selector Dial Control handwheel.



1¼" Bar Capacity—14" Swing. Plain and Back-Geared. Timken Bearings. Spindle Brake. Write today for descriptive bulletin.

SIMMONS
MACHINE TOOL CORP.
1725 NORTH BROADWAY, ALBANY, N. Y. *New York office: 149 B'way*

DYER

Heavy Duty Spot Welders

Floor models 10 to 35 KVA.

6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

3 point switch on bench models.

Bench models 2½ to 10 KVA—with or without pedestal.

PROMPT DELIVERY

Few Territories Available.

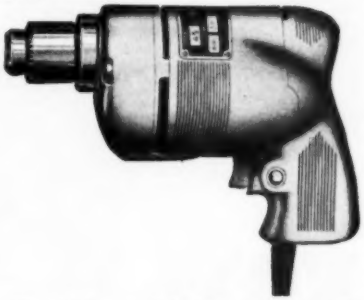
Dyer Welders are available in a wide range of sizes and capacities—air, motor or foot operated, giving maximum production—simplicity of operation—power economy.

The Topeka Foundry & Iron Works Co.

300-332 Jackson St., Topeka, Kansas

Skilsaw Announces New ¼" Drill

A new ¼" drill, called Skildrill is announced by Skilsaw, Inc., 5035 Elston Ave., Chicago.



Weight is only 2-¾ lbs., and it is only 6-⅝" long overall and 2-9/16" wide. Fits comfortably in the palm of a man's hand for drilling in tight spots. Its ease of handling adapts it for production work in aircraft, tank, automobile, refrigerator, and other industrial fabrication.

Features include:—Die-cast body for strength with minimum weight; complete anti-friction ball and needle roller bearings; helical-cut gearing throughout; two-pole momentary contact switch with lock for continuous operation; universal motor.

No-load speed is 1800 r. p. m. and full-load speed, 1050 r. p. m. Drilling capacity in steel is ¼" and in hardwood ½". Like all Skilsaw tools, it is sold by distributors of mine, mill, hardware and contractors' supplies.

PRESSED STEEL MELTING KETTELS

Furnished complete with pouring lip, hinged bail, and tilting hooks or pouring handle.

Send US your inquiries.

The Salem Tool Co.

SALEM OHIO

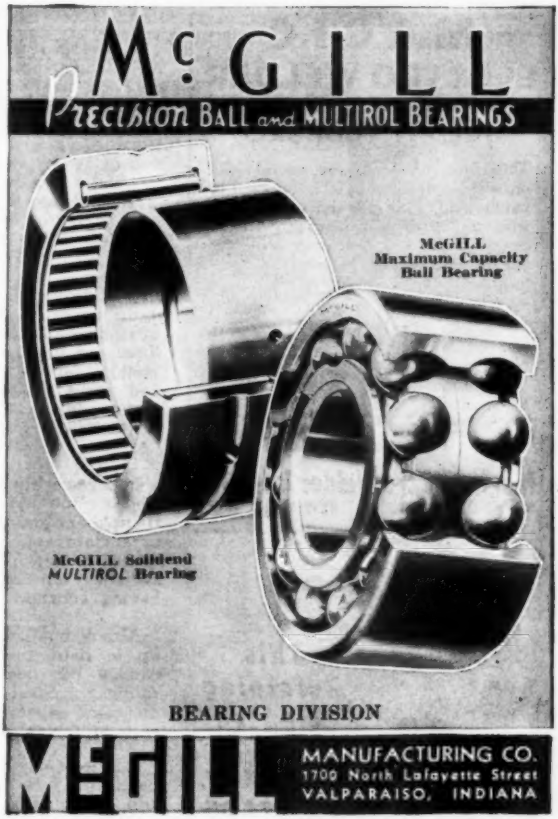
Chemistry

From thimble-sized vessels of a "vest-pocket chemistry laboratory have come clues to help defeat more than 100 invisible enemies of machines — spots which mar their metal surfaces and reduce their efficiency — according to Dr. E. Bruce Ashcraft, microchemist at the Westinghouse Research Laboratories.

These "Tom Thumb" tools of microchemistry have helped improve electrical apparatus ranging from vacuum tubes to the world's largest power generators—the 1,000-ton machines now being installed at Grand Coulee Dam. Invisible things in the air, such as oxygen, water vapor; sulphur, salt ocean spray and oils, cause spots of rust, corrosion, and tarnish on metal parts.

The tiny chemistry apparatus is a part of the laboratories' microchemical section, established three years ago. In this laboratory tiny flakes of rust and tarnish are measured in millionths of ounces, samples so small it would take several hundred of them to weigh as much as an aspirin tablet. Since such small amounts would be lost in ordinary chemical apparatus, tiny flasks, beakers, crucibles, and test tubes are used. Acids and other liquids are handled with a medicine dropper.

As an example of the work of microchemistry, it was discovered that film spots interfered with the operation of vacuum tube filaments. Analysis showed that bits of silica, or glass, from the tubes' bulbs had deposited on the filaments. Ordinary distilled water used in the laboratory had been kept in glass bottles and had dissolved enough silica from the walls of the bottles to confuse the measurements of the silica in the film sample. This special water had to be stored in platinum bottles to keep it pure.



MAGIC
ELECTRO WELDER

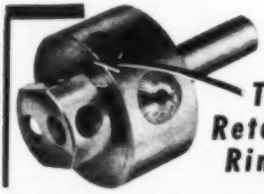
WELD IT YOURSELF

This handy, moderate size, useful welder, which sells for $45.00 is designed to handle odd small jobs that would otherwise tie up large expensive welders. Several located in your plant will save trips to the welding department. Easy to Use.

Will weld, braze or solder. Can be used for small butt, lap, or fillet welding. Welds fractures in cast iron; fills cracks and pits in bronze and aluminum castings and builds up bearings, gears, worn shafts, etc. Plugs into any 110 volt a. c. outlet. Guaranteed for one year.

Write for details.

Magic Electro Welder Mfg. Co.
239-241 CANAL ST., NEW YORK, N. Y.



This Retaining Ring on

FRAY Micrometer
OFFSET BORING HEADS

. . . helps carry the load thrown on the tool carrying block—keeps chips from micrometer mechanism—eliminates sharp corners that might catch on operator—maintains full strength with all the advantages of round construction. An *exclusive feature.*

FRAY MACHINE TOOL CO.
501 W. Windsor, • Glendale, Calif.
Maker of "ALL ANGLE"
Milling Machines and Milling Attachments

Quick Selector Catalog

A second 1941 revision of the popular "Quick Selector" catalog is announced. Issued twice a year, this 60-page catalog has found wide use because it simplifies the selection of electrical equipment for any motor, lighting, or feeder circuit.

Divided into 6 parts the scope of the catalog is as follows: — 1. Safety switches—single and double throw with and without fuses. 2. Nofuse breakers — 50 to 600 ampere frames for all types of locations. 3. Nofuse multibreakers. 4. Panelboards—Multibreakers, Deion, combination, plug-fuse, and fusible distribution types. 5. Motors — single phase, capacitor, two and three phase, standard, and gear motor types. 6. Motor control — Manual and magnetic with accessories.

Important changes in the new revision are the addition of industrial Multi-breakers and the dropping of breaker enclosures made of aluminum. Included is new rule for applying safety switches on continuous duty circuits having constant loads.

Although all data have been brought up to date, the general form of the catalog has been retained. Electrical ratings, physical dimensions and circuit diagrams expedite the selection of correct equipment for each purpose.

A copy may be obtained from department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Have you our Engineering Data Sheets on the new line of

BABY GUSHER
Machine Tool Coolant Pumps?

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

Write for descriptive literature.

The Ruthman Machinery Co.
1819 Reading Rd., Cincinnati, Ohio

Inventions

Describing the work of the National Inventors' Council of which he is chief engineer, Col. L. B. Lent told the A. S. M. E. recently that some revolutionary new weapons submitted to the council are now under test and development and "may, some day soon, be heard from in tones not pleasant to the Axis powers."

"Obviously, the nature of these cannot be disclosed," Col. Lent added.

Col. Lent said in part:

"And it may also interest you to know about the ideas having potential value to the armed services; — about 40% are in the general field of ordnance, which includes all kinds of guns and ammunition and also tanks, amphibians, and fire-control devices; about 20% are in the field of aircraft, including power plants and flying equipment and the remaining 40% encompass all other phases of warfare.

"The number of devices and ideas which are of potential value is quite surprising and most encouraging.

"As you may imagine, we do have many suggestions of what is sometimes called the 'crack-pot' variety. Such suggestions, however, receive full consideration, for in them may lie the germ of a worthwhile idea. However, the daily consideration of these cases brings a growing conviction of the need of a larger percentage of ideas coming from those who know their subject.

"Of course, we have had 'death rays,' but none of these has yet killed anybody.

"But—as previously intimated—don't be too surprised if something radically new and potent comes to light before this present scrap is over."

THE JOHNSON FRICTION CLUTCH

HAS FLOATING PLATES

THE NEW "MAXITORQ" MULTIPLE DISC DESIGN

...for better clutch performance under ANY CONDITIONS

More than thirty years of successful application of JOHNSON FRICTION CLUTCHES to practically all power transmission demands is behind every recommendation made by our Engineering Department.

You can, therefore, depend on better clutch performance regardless of the severity of operating conditions, when you bring your clutch problems to JOHNSON Engineers for study.

Among the operating features which contribute to better performance are sensitive starting, safety, cleanliness, quietness, efficiency and long life.

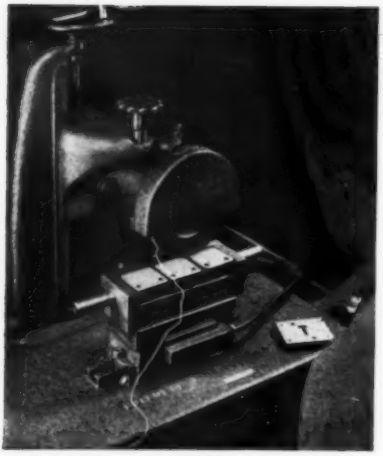
You incur no obligation in asking us to show specifically how you can improve power transmission on your machines. Just give us the details of your problem.

Write for Multi-Disc Clutch Catalog No. B-122 or Consult "Sweet's" or "Thomas' Reg."

Double Has "Floating Plates" in neutral

Single

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN



BUILDERS
T'
SURFACE GRINDER

The ideal, inexpensive, hand-operated grinder for small parts (see photo), tools, dies and 1001 other small grinding jobs.

Send For Bulletin 644

BUILDERS IRON FOUNDRY
21 Codding Street
PROVIDENCE RHODE ISLAND

Three New Industrial Tubes

Three new industrial tubes—a thyratron, a kenotron, and a phototube sensitive to blue—have been announced by the Vacuum Tube Section, Radio and Television Dept., General Electric Co.

The newly designed GL-414 Thyratron is an all-metal, negative-grid tube for general-purpose industrial applications. Since it has a shield grid, it is especially suitable for control circuits where the available grid power is very small, and where it is desirable to actuate the grid from a high-impedance source. Typical applications include use in motor controls, welding controls, power rectifiers, and in voltage regulators.

The new thyratron has an indirectly-heated cathode rated at 5 volts, 20 amperes. Maximum peak inverse anode voltage is 2000 volts and average anode current is 12.5 amperes.

The GL-451 Kenotron is a half-wave rectifier. rated 30,000 volts peak inverse, 500 milliamperes peak, 100 milliamperes average. Its thoriated tungsten filament makes possible a higher rating for size than does a pure tungsten filament. Light weight and a tantalum anode permit construction unaffected by ordinary vibration. This tube is designed to meet high-voltage, low-current requirements. It is especially suitable for use with smoke-precipitation and air-cleaning devices.

The GL-441 phototube is especially designed for a high response in the blue region of the spectrum, and has 30 times the quantum efficiency of red-sensitive tubes. Sensitivity is 45 microamperes per lumen at an anode voltage of 90.

Die Spring Bulletin

A new die spring bulletin has just been published by the Muehlhausen Spring Corp., Logansport, Ind. The new 8½" x 11" four-color bulletin illustrates, describes and prices die springs for high speed presses, regular speed presses, and heavy duty presses. Printed on heavy card stock for convenient filing, all die spring information is presented in a condensed tabular style easy to understand. Copies are available on request.

Danger

Hundreds of plants are today being forced by our wartime economy to use new chemicals in their processes. This situation exposes men, as well as machinery and materials, to a wide range of hazards with which they are not familiar and demands the serious consideration of management if accidents from these causes are to be held in check. A five - point program for preventing accidents from chemicals is suggested by Mr. E. Ward Thompson of American Mutual.

1. Management must make a point of knowing whenever any new chemical is introduced into the plant. Instances have occurred in which such substances have been used without knowledge of possible hazard. The first warning of its dangerous character has come when workers have developed dermatitis or other occupational disease, or when a fire has occurred. The purchasing agent or plant superintendent must keep management informed as to substitutes or the use of new products.

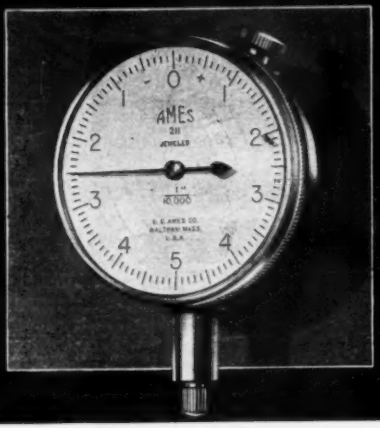
2. The pathogenic properties of each new chemical must be determined. If trade sources are unable or unwilling to provide such information, chemical analysis by any recognized laboratory will answer the question.

3. The third step is to evaluate the hazards pertaining to each chemical substance. This information may be obtained from insurance company safety engineers, from state authorities and other sources.

4. Once determination of hazards has been completed, the problem is to safeguard the workers by mechanical means or safe practices.

5. The final step is to gear the plant to handle dangerous new chemicals safely. This involves company regulations for storage, transit and point of operation handling. Regulations must be enforced. It involves issuing instructions to supervisors, who in turn relay them to each worker dealing with the chemical.

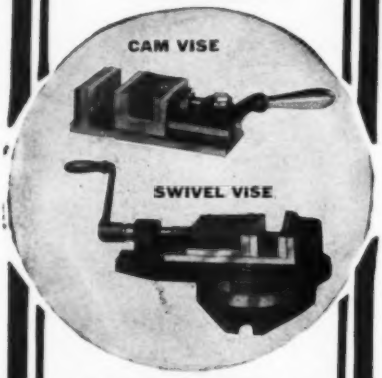
AMES Hundred Series
DIAL INDICATORS



Made to A. G. D. specifications in four sizes with fourteen different dial numberings indicating thousandths, half and tenths of thousandths inches. Plain or jewel bearings. Shock absorbers for all models.
Send for new catalog No. 52

B. C. AMES CO., WALTHAM, MASS.

"MODERN" VISES



"MODERN" VISES are precision-built with hardened and ground jaws for rapid production work on milling machines, shapers and drill presses.

CAM VISES—Jaw Dimensions: width 4" or 5", depth 1½", maximum openings 2" or 3".

SWIVEL VISES—Jaw Dimensions: width 4", depth 1½", maximum opening 3". Can be used without base.

Write for folders.

MODERN TOOLS,
EAST BERLIN CONN.

Manufacturers of precision high speed steel and carbide cutting tools.

Adapter Type Live Center

The Sturdimatic Tool Co., 5226 Third Avenue, Detroit, Mich., recently added a new type live center to supplement their already popular line of ball bearing centers. The new center is called the Adapter Type Live Center. It was

developed primarily to take care of short or long run production, and still can easily be changed over to take care of special applications without going to the expense of purchasing new centers for each special job.

The adapter center conforms in general dimensions with the present standard Sturdimatic live centers, except that this new design has a threaded nose, to which various sizes and shapes of adapters can be screwed on. The center becomes the master to which many adapters can be applied as the need arises.

The illustration, showing male, female and collet adapters gives only a few of the many applications that are adaptable to this new center. The Company announces a complete Engineering Department to help solve center problems. This service is given without charge or obligation.

REMEMBER PEARL HARBOR!

TRICO OILERS
SAVE—TIME
OIL—WORRY
No guesswork — bearing failures — idle machine time or waste when you modernize with TRICO.
WRITE FOR BULLETINS
TRICO FUSE MFG. CO.
MILWAUKEE, WIS.

Training

Some 800 men from the Philadelphia area are attending an "industrial college" in the Westinghouse South Philadelphia works to learn how to produce vital marine equipment. More than 350 "graduates" of the training course are at work as full-fledged machine operators in the big plant.

Student - employes are being trained by skilled company craftsmen to operate precision machine tools used in making turbines, gears, and other apparatus to drive Navy and merchant ships.

Enlargement of the program to train 1000 additional men for a new merchant ship equipment plant being built at Lester, Pa., was announced recently. More than 200 new student-employes already are being trained by the company in vocational and high schools of Philadelphia and Delaware County.

The intensive program, conducted in the manufacturing shops of the plant, is turning out competent machine operators in from four to ten months, depending upon previous experience and aptitude of the students.

Men with no experience in this type of manufacturing have been put to work on precision jobs after only eight months of training. Others who were employed as helpers and assistants have been advanced to regular operation after only four or six months instruction.

"Learners," as trainees are called, are paid to learn. As they become proficient, their wages are increased until they can take regular positions at full production rates.

Student-employes are advanced as rapidly as they can absorb instruction and demonstrate their ability to operate machines. To speed training, the men are assigned to one type of machine for the entire course.

172 PAGES of Modern... OIL CUPS · · OIL SEALS · LUBRICATING DEVICES

CATALOG No. 60

This practical

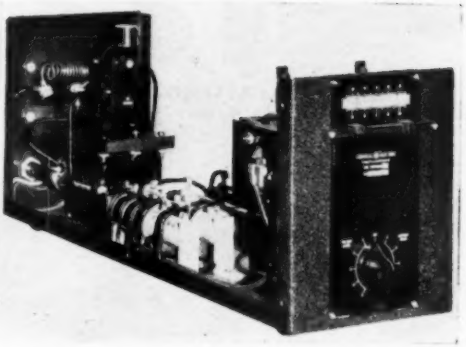
Lubricating Manual and Buyers Guide is yours without obligation. It systematically covers practically every industrial requirement in Oil Cups, Oil Seals and Lubricating Devices, together with schematic diagrams and Engineering data. Write for your copy TODAY!

GITS BROS. MFG. CO.

1860 South Kilbourn Avenue • Chicago, Illinois

30 years of oil cup experience

G. E. Magnetic Oscilloscope



A new peak - reading portable magnetic oscilloscope is announced by General Electric Co., Schenectady, N. Y. Developed primarily for use in resistance welding, it may be applied as a supplement to other instruments used in trouble - shooting and in making installation adjustments.

Among its varied uses in the field of resistance welding are:—checking operation of electronic controls; adjustment of starting angle of control to correspond with power-factor angle of welding machines; adjustment of full-wave setting on control of phase-controlled welding machines to correspond with 100 per cent "heat" of control dial; current measurement (full wave only) for very short "on" intervals; voltage regulation measurements; observation and measurement of magnitude of starting transients on nonsynchronous welding control; and current measurements made with pointer-stop instruments.

A gear lapped in assembly with Timesaver Lapping Compound

PRECISE FITS—
IDEAL LUBRICATION—
QUIET OPERATION
with
TIMESAVER LAPPING COMPOUND

Especially prepared for the fitting and smoothing of gears and bearings in assembled units.

REDUCE COSTS—By eliminating hand scraping and running in operations.

EASY TO USE—Simply mix with oil and apply.

SAFE—Will not charge into metal surfaces or continue to cut.

TIME TESTED—Used by leading manufacturers for the past sixteen years.

Grades for ferrous and non-ferrous metals.

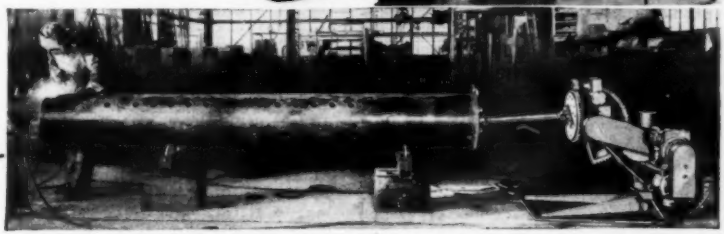
Ask for testing samples on your letterhead.

TIMESAVER PRODUCTS COMPANY
33 S. DESPLAINES ST. CHICAGO, ILL.

Another production problem economically handled with

C-F WELDING POSITIONERS

The easy, safe and fast way to turn heavy tubular structures for flame-cutting and welding is to use a C-F POSITIONER as shown, with a flexible coupling arm which requires no accurate alignment for turning and affords complete speed control. There is a saving here in time and labor with better results. C-F WELDING POSITIONERS are fully described in our circular WP 20. It is free upon request.

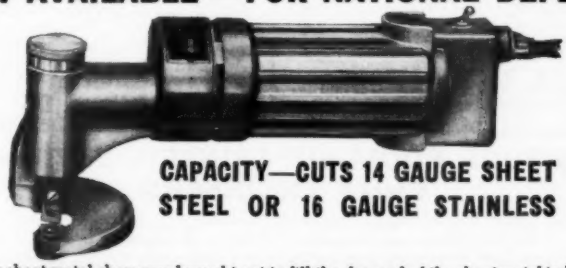


CULLEN-FRIESTEDT CO.

1321 S. Kilbourn Ave., Chicago, Illinois

GES *Electric Hand Shears*

NOW AVAILABLE — FOR NATIONAL DEFENSE



CAPACITY—CUTS 14 GAUGE SHEET STEEL OR 16 GAUGE STAINLESS

This new sheet metal shear was brought out to fill the demand of the sheet metal industry for a very light weight but powerful, fast cutting tool, capable of cutting accurately to the line along straight lines as well as along small curves.

This sturdy shear will give a life time of service. The ball bearing "Grip" type Universal motor ⅛ horse power will operate on either AC or DC and 110 or 220 volts, 25 to 60 cycles. This new model has fuse protection incorporated in switch box. Alloy Steel cutters—will cut at the rate of 6' 6" per minute on 14 gauge sheet steel. *Write for further information.*

James W. George Machinery Company

3146 EAST JEFFERSON AVENUE, DETROIT, MICHIGAN

Wrigraph
PRECISION DRAFTING MACHINE

Brief Case Size Illustrated.

New large INDUSTRO Drafters available — tubular arm, ball-bearing machines. Complete range of sizes up to 36"x48".

Free trial offer and catalog on request.

Write for literature and prices on Larger Models

L·C·WRIGHT, INC.
6203 CARNEGIE AVE., CLEVELAND, OHIO

ELIMINATE HAND REAMING WITH THIS POWER REAMER

Power Reaming at its best. Saves time and money. Improves your work. Speeds up removal of burrs from tubing as well as from bores after keyseating or drilling of set screw holes. The Catskill also saves on finish reaming, countersinking and counterboring, smoothing off and chamfering sharp edges of round bar stock and many other finishing jobs.

Write for details and prices.

CATSKILL METAL WORKS
CATSKILL, NEW YORK

The oscilloscope has a high-speed response to both current and voltage, made possible by the use of a permanent-magnet type of oscillograph galvanometer. Magnitude, symmetry, and uniformity of current wave are revealed quickly by the length, position, and uniformity of a horizontal trace of light on the ground-glass viewing screen. A narrow light beam from an internal lamp impinges upon the tiny galvonometer mirror, the movements of which are reflected to the viewing screen. The instrument requires no reset time—a quick change from potential to current measurement is accomplished by turning a switch on front of box. The instrument is almost entirely free from magnetic field interference. It is shown with cover removed.

The instrument weighs approximately 14 lb., is 7" high, 6" wide, and 17" long. It operates from 110-120-volt, 60-cycle current, using 25 watts. A connecting lead with attaching plug is furnished.

NUMBERALL
Numbering Machines
Automatic and Hand Operated

for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.

For Marking Metal Parts, Name Plates, Metal Checks, etc.

Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

TOOL ROOM SUPERINTENDENTS
CHIEF ENGINEERS

NOW,—as never before—speed up with Stadoil.
Stadoil Diamond Lapping Oil saves diamond wheels.
GREATLY INCREASES WHEEL LIFE AND TOOL LIFE
FOR WIRE DRAWING DIES • SURPRISING RESULTS ARE SHOWN
Ask any Carbide Tool or diamond wheel manufacturer's representative as to the value of STADOIL.
ORDER THRU YOUR MILL OR TOOL SUPPLY JOBBER.
Many sizes available

STADOIL MANUFACTURING COMPANY
617 So. Beacon St. Dallas, Texas - 3221 So. Figueroa St. Los Angeles, California.

Developer

Pressed into 24-hour-a-day service to speed defense orders, the largest developing machine of its type in American industry is turning out 18,000 drawings daily at the East Pittsburgh Westinghouse works. These drawings or prints for use in making electrical equipment are produced by an original method called "Black and White (B. W.) Direct Printing Process." The 80" machine brings out the drawings in black lines upon white paper, developing more than 10 miles of 36" wide paper per month.

Recently the Navy sent tracings of destroyer equipment to East Pittsburgh with rush orders for 553 prints, each ranging from 13 feet to 25 feet in length. The completed prints weighed 200 lbs. and were turned out by seven men with the assistance of their mass production machinery. Such a task, which a few years ago would have overwhelmed the reproduction division's facilities, can now be prepared for shipment within 24 hours without slackening the regular flow of work.

This process is reported to require but 50 seconds to expose and develop a print. The large machine uses only two gallons of water a day.

In direct process, a chemically coated paper is run through the printing machines.

NOW ONE SANDER

DOES THE WORK OF THREE

... and Does a Better Job

WORRIED about help? Do you think that sanding is a slow-motion job that calls for scarce and skilled man power? Be at ease! That's no longer true!

"SANDY" does the work of three handsanders and releases your available man-power for **OTHER** work!

DON'T ASK US—ask the "Sandy users" in every industry! They're getting the profits and the speed that you're losing!

Sandy's method is easy. Sandy does three thousand CONTROLLED ⅝" strokes a minute—and he's easy to manage, even in the hands of an unskilled man. No wonder Sandy replaces three men with one man! Get the facts! Send the coupon today—while the problem is on your mind!

In Metal Working: Sterling Engineers are a concentration of fast, economical QUALITY metal finishing experiences — experience gathered in the finest plants across America. Ask to see a Sterling man!

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371 E. Ohio St., Chicago, Ill.

"I'LL DO YER SANDIN' THREE TIMES AS FAST"

Fill out coupon—drop it in the Mail TODAY!

Sterling Tool Products Co.,
371 E. Ohio St., Chicago, Ill.
Please RUSH "Hints on Sanding Savings" to me at once!
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Address.....
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SOLID OAK OR POPLAR GS MACHINISTS TOOLCHESTS

Also leatherette-complete line. The right type of chest for for every mechanic from higher grade to more reasonably priced.

BEFORE ORDERING ANY TOOLCHEST, write for our literature.

Geo. Scherr Co.
122 Lafayette St.
New York, N. Y.

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

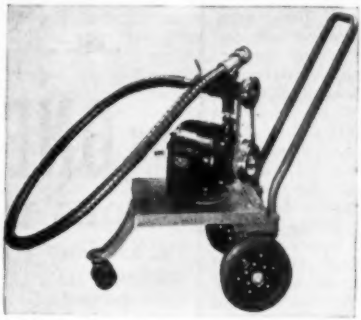
Beware of Imitations! Our machine carries the Butterfly trade mark.

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.
161 Grand St., New York
Phone: CAnal 6-5170

Haskins Adopts Semi-Pneumatic Tires

R. G. Haskins Co., 623 South California Ave., Chicago, Ill., announces that its heavy duty truck-mounted

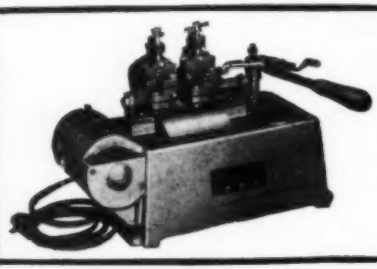


Flexible Shaft Machines are now provided with semi-pneumatic rubber tires. The equipment shown is the Haskins HS-7, 1 h. p. unit. Descriptive Bulletin will be sent on request.

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK
Cable Address: "Pretool-New York" Tel: MAin 4-1064



BAND SAW-WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7325 McDONALD AVE., DETROIT, MICH.

Employment

Administrator Paul McNutt declares that a new source of much needed labor is being opened up to war industries as workers are released from peacetime production which is cut off or reduced because of shortages of materials.

In October, for the first time in six months, be said, there was a slight increase—about 2%—in the number of workers available for war work through the 1,500 State—operated employment offices. A total of 229,000 fully qualified workers were registered in 623 important occupations. However, shortages still persist, McNutt said, in many key wartime occupations especially in the ship and boat-building, aircraft, and ordnance industries.

The monthly inventory of labor supply for essential occupations conducted by the Bureau of Employment Security of the Social Security Board has shown a steady decrease since last spring. In October, however, there was a 9% increase of available workers in the metal machining occupations, bringing the total to 13,000. Mr. McNutt attributed the rise in registrations to lay-offs of workers in the automobile, refrigerator, washing machine, and other consumers durable goods industries. Shortages of strategic materials also resulted in some increases in the supply of needed workers. Most of these workers, he said, will be quickly absorbed by expanding war plants.

Despite this increase in the number of registered workers, war industry centers report that the number of qualified workers is insufficient to meet their needs. For example, the vital ordnance and machine tool centers of Connecticut, have only about 1,000 qualified workers registered to meet an estimated need of at least 18,000. Shortages of similar magnitude are reported on the West Coast, where 60,000 job openings are expected.

NORGREN

Vitalizer **UNITS**

Pass your air power through a Norgren filter and it's as clean as the breeze atop Pikes Peak! The filter stops scale, other impurities, and excess moisture.

Then let the Norgren Lubricator vitalize every tool in your plant with a *controlled fog of oil*. There is no substitute for Norgren air tool lubrication.

Positive, continuous, regulated oil feed. You can't forget to turn it on; there's no need to turn it off! No working parts. Sight feed; you KNOW it is operating. No loss of air pressure passing thru the Lubricator.

Catalog 400. There's a Norgren air cleaning, oiling, and control assembly for every place air is used in industry.

C. A. NORGREN CO.
DENVER, COLORADO
236 Santa Fe Drive

Arc Welding at Parker Dam

Seven arc welding operators are shown ganged up on a penstock section for the new Parker Dam power project, Bureau of Reclamation of the U. S. Department of the Interior, at Parker Dam, Cal.

Employing the shielded arc process of electric welding, the huge penstock was entirely fabricated. Automatic carbon arc welding by the Lincoln "Electronic Tornado" process was used extensively. Chicago Bridge & Iron Co., did the fabricating and welding of the penstock.

Huge cylindrical segments were placed on power driven rollers which turned the structures into position for welding.

Photo—Courtesy The Lincoln Electric Co., Cleveland, Ohio.

BUY DEFENSE SAVINGS BONDS

NEW LOW COST
DRILL GRINDER

Anyone can do expert drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1¼. Write for FREE literature.

T & H MFG. CO.
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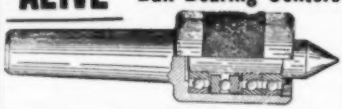
"ALIVE" Ball Bearing Centers



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"Bottle Neck" In Threading Ammunition Eliminated

A New Automatic Thread Miller

FACILITATES

Fool-Proof Cutting Left and Right
Internal and External Threads
Up to 7" Outside Diameter
5 to 20 Threads Per Inch

Irregardless of Thread System including Metric. Inspection Rejects Eliminated.

Combining Accuracy, Ease of Operation, Economy, Interchangeability of Parts, Precision, Simplicity With Low Price and

SPEEDY DELIVERY.

Agents with proven following wanted in various states of the U.S.A.

U. S. MACHINE TOOL MFG. CORP.
100 So. 6th St. Terre Haute, Indiana

Maelstrom

A large and powerful unit of a type called the rheotron opens a new field with its electron stream far more penetrating than the electrons from radium, according to G-E Research Laboratory.

This feat is largely due to the work of Dr. Donald W. Kerst, and is based on his earlier studies at University of Illinois, and on a small machine which he built there. By means of the new unit, electrons are pushed to what is said to be the highest speed ever produced by a man-made apparatus. It gives these particles energy corresponding to 20,000,000 volts and also produces x-rays of this power.

Dr. Kerst, a 30-year old physicist now in the Laboratory on leave from the U. of I. faculty, built the new rheotron with aid of G-E engineers and scientists.

So promising have been the results obtained with the rheotron, that the Laboratory has already started work on a larger one to cost more than a quarter of a million dollars and designed to whirl electrons to an energy of 100,000,000 volts.

"The rheotron does for negative electrons what the cyclotron does for positive ions but does it in a different way," explains Dr. Kerst, "and, for a given voltage, it is much smaller." He also disclosed that the radiations from the machine have made copper radioactive.

Dr. W. D. Coolidge, director of the laboratory, said that the rheotron provides an important new tool for fundamental research.

COVEL

NO.5 HYDRAULIC SURFACE GRINDERS for Precision Jobs in Submarine Building

A large shipyard uses this Covel No. 5 Hydraulic Surface Grinder for producing accurate flat surfaces on submarine parts. Note convenient controls. Easily-read graduations on rim of elevating hand-wheel at operator's right. Patented double elevating screw insures accurate vertical movement of grinding wheel. In addition, cartridge type spindle is mounted on two double-row spring-loaded precision ball bearings. "No. 5" is capable of producing precision finishes at "defense production" speeds. Write for specifications.

MODERN IN EVERY DETAIL

One piece standard . . . Telescoping guards on all vertical ways . . . Built-in wheel truing device . . . 3-speed motor driven spindle . . . Table speed variable 10 to 90 fpm . . . Table reverses without shock . . . Transverse travel automatic, 0" to .175" per reversal of table.

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

Cleveland No. 1 Vertical Milling Machine

A lineup of new machines ready for shipment is shown in the plant of Sommer & Adams Co., 18511 Euclid Ave., Cleveland, O.

The No. 1 Clevelands offer a longitudinal feed capacity of 18", cross feed of 8" and 16" vertical feed.

Table working surface is 8" x 32". There are 3 T-slots, 17/32" and power is provided by a 1/3 h.p. motor. Twelve table feeds are available with a range from .6" to 12½" per minute.

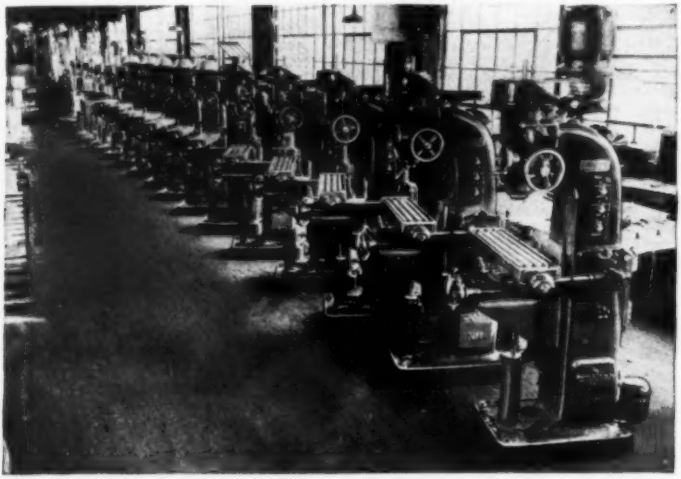
Spindle is of chrome nickel steel, heat treated and ground, with No. 30 taper (new National standard). Preloaded precision ball bearings are used.

Twelve spindle speeds are provided ranging from 100 to 1850 r.p.m., driven by a 1½ h.p. flange mounted motor and adjustable with hand wheel for quick shifting of V-belt for speed changes.

Feed screws mounted on Timken bearings are provided with dials graduated in thousandths. Feed gears are of chrome nickel steel, mounted on Timken bearings.

Cutter capacity is stated to include 1/16" to 2½" mills.

The design is said to provide for high speed operation with the installation of a 2-speed motor (1800 and 3600 r.p.m.) offering 8 operating speed changes.



Why Not Buy The Original Electric Etcher?

MARK IRON AND STEEL

THE ETCHOGRAPH WAY

New ELKONITE TIP pencil.
New Baby Grand Model at a lower price.

2,000 in use

BREWSTER - SQUIRES CO.

42 Church St., New York, N. Y.

Milburn Welding Torch

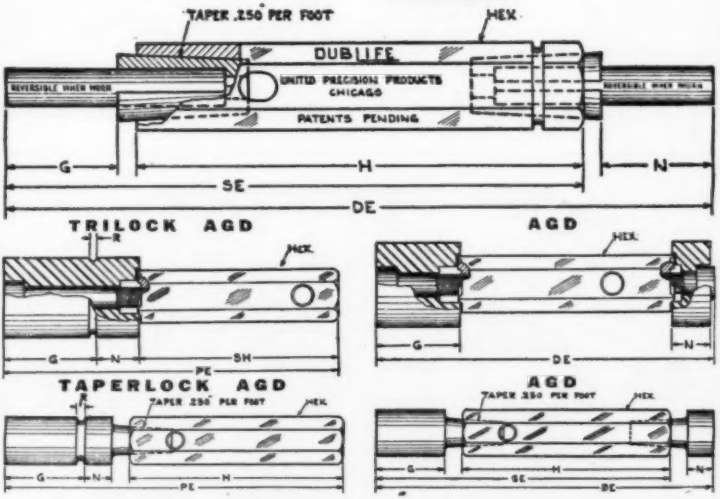
Specifically for aviation, the Alexander Milburn Co. announces release of their new Type MM Welding Torch. It is lightweight, easy to operate and has an accurately controlled flame that is adaptable for intricate work, yet hot enough to permit its use as a heating torch.

It is designed to give best results on thicknesses of ⅛" and less up to ½". It is particularly useful with stainless steel and similar alloys requiring exact heat and flame control. Because of its balanced design, it is handy in working around the awkward shapes oftimes confronted in airplane construction.

It can be used as an adjunct to the lighter, smaller aviation torch, by using the MM Torch to heat the area, and the small torch to weld.

For further details, write the Alexander Milburn Co., 1493 W. Baltimore St., Baltimore, Md.

The New **DUBLIFE** *Gauges*



United Precision Products, exclusive manufacturers of Plug Gauges, announce a new improved DUBLIFE Gauge. The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, so that when one end is worn the other end can be used, thus giving double life. 30,000 gauges in stock ranging from .030" to 1".

A new catalog showing DUBLIFE and AGD Gauges will be sent to those requesting it on company letterhead.

UNITED PRECISION PRODUCTS CO.

4618 W. HURON ST., CHICAGO, ILLINOIS

Eliminating Moisture

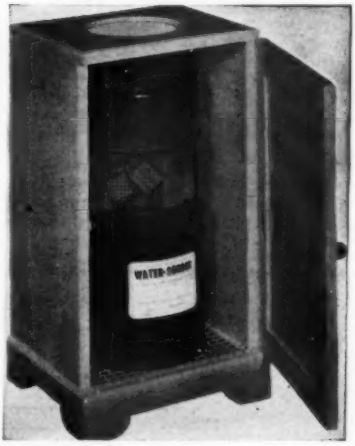
The Water-Sorber Circulator is claimed to be capable of holding fairly low humidity in spaces up to 2000 cu. ft., where infiltration is at a minimum. This small inexpensive dehumidifier has many applications where moisture is harmful or causes discomfort.

The only electrical connection necessary is plugging into an ordinary light socket. The small fan circulates dry, clean air into the space to be conditioned, giving quick results.

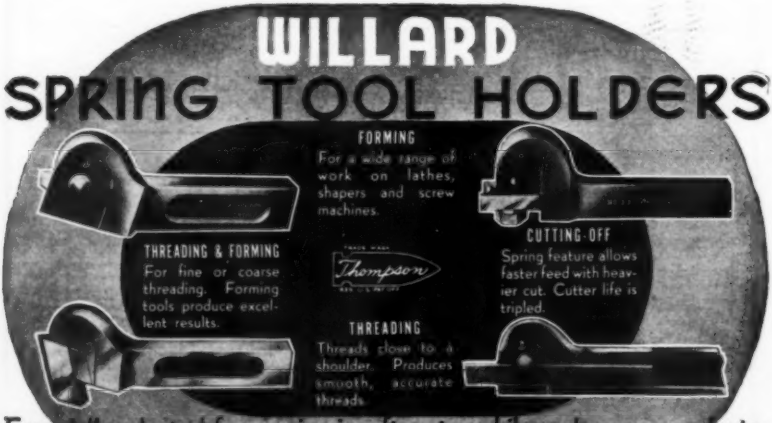
The device is recommended for tool rooms, hospital operating rooms, storage spaces, food supply storage, and many other applications, including dehumidifying in winter for show windows to eliminate moisture, steaming and freezing.

Cabinet is 26" high, 14" wide, 12" deep. Fan capacity 100 CFM. Weight 30 lbs., complete with 10 lbs. of chemical.

It is manufactured by The General Air Conditioning Corp., Cincinnati, Ohio.



BUY DEFENSE SAVINGS BONDS


WILLARD
SPRING TOOL HOLDERS
FORMING
For a wide range of work on lathes, shapers and screw machines.
THREADING & FORMING
For fine or coarse threading. Forming tools produce excellent results.
Thompson
CUTTING-OFF
Spring feature allows faster feed with heavier cut. Cutter life is tripled.
THREADING
Threads close to a shoulder. Produces smooth, accurate threads.

Especially adapted for use in aircraft, automobile and accessory plants.
No Chatter or Tearing. No Breaking of Cutters. No Damaged Work. Write for Details.

AUTO ORDNANCE CORPORATION
1439 RAILROAD AVE. BRIDGEPORT, CONNECTICUT

Turbine

Greater economy than for any previous installation is anticipated for a turbine-generator recently placed in service near South Bend, Indiana.

Built by G. E. Co., it is designed to use steam at an initial pressure of 2300 lbs. per sq. inch, said to be the highest ever used in an electric generating station in this country. This is reported to exceed by 900 lbs. the previous highest pressure for central station turbines.

The new unit is of a cross-compound type with a total rating of 76,500 k.w. The high-pressure turbine of the set, which operates at 3600 r. p. m., uses steam at an initial temperature of 940° F., resuperheated to 900° F. for the low-pressure turbine operating at 1800 r.p.m.

According to the chief engineer of the power company the new high-pressure unit is consuming just about one pound of Indiana coal per kilowatt-hour whereas the average turbine consumes two-thirds more heat units.

The most significant fact about the high-pressure machine is that standard types of design were adapted to the severe operating conditions with relative ease. As a result, few difficulties were encountered in manufacturing and placing the unit in service.

The resuperheating cycle was ideally suited to the design of the cross-compound machine with the high-pressure turbine at 3600 r.p.m. and the low-pressure turbine at 1800 r. p. m. because it gives from one-quarter to one-third of the maximum capacity of the combined set to the high-pressure unit, and the remaining capacity to the low-pressure unit.

FASTER SPOT WELDING TO MEET WAR NEEDS

NEW Weld-Timer Insures Greater Speed and Uniform Welds

New war demands, make necessary greater daily production—and if spot welding is employed in your manufacturing you can insure more and better welds,—less spoilage losses with ACE Welders equipped with our own new Automatic Weld-Timer.

This equipment makes it possible for even the non-expert welder to speed up production with guaranteed uniformity of weld. The operator need only make the simple timing adjustment for the job and proceed. No matter how he operates the foot pedal the exact timing is assured, the Timer guarding against over- or under-welding.

ACE Welders also have an improved adjustable toggle pressure mechanism which makes operation easy even from a sitting position.

There is one responsibility with Welder and Automatic Timer of **one** make,—the Timer being designed expressly for Ace Welders and available as a regular part of the complete Welder . . . Deliveries are still made in reasonable time . . . Write today for Catalog 40.

New Automatic Weld-Timer

PIER EQUIPMENT MFG. CO.

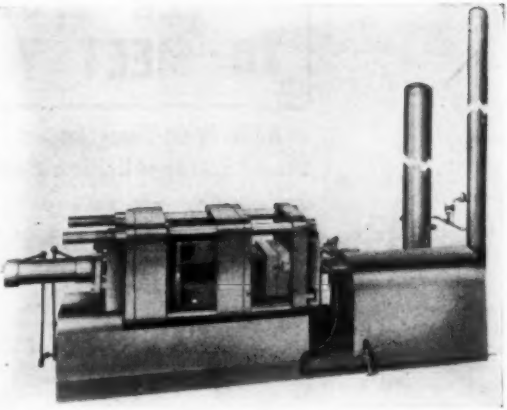
1432 Milton Street, Benton Harbor, Mich.

PEER

ACE SPOT WELDERS

with New Automatic Timer

Harvill Die Casting Machines



As a means of speeding production of magnesium, aluminum and copper base alloy die castings, which have jumped into the foreground as a method of reducing production costs and assembly time during recent years in the aircraft and other defense industries, the Harvill Aircraft Die Casting Corp., 6253 W. Century Blvd., Los Angeles, recently announced that Harvill die casting machines will be offered to other companies, including the techniques and production methods pioneered by the Harvill organization.

The Harvill firm is credited with developing die casting machines and processes for die casting aluminum, magnesium and copper base alloys that result in castings which have physical characteristics far in excess of specifications. Aluminum die castings from Harvill machines are asserted to have tensile strengths of over 38,000 pounds per square inch, with over 3% elongation; which permits the use of aluminum die castings for many structural parts that formerly had to be fabricated or produced by slower and more costly methods.

Three sizes of machines are available; the largest for dies of 21½"x40" in overall size. Each machine is complete with specially developed accessory equipment, such as alloying furnace, holding furnace, ladles, and pyrometer control equipment. According to Henry L. Harvill, president of the firm and a pioneer in the field of die casting light-weight alloys, it has required over 12 years research and experiment to perfect the die casting machines and accessory equipment to the point where they can be offered to other firms with assurance that they can duplicate the high standards established by this firm.

SCREW MACHINE SET-UPS
COMPLETE
FOR
BROWN & SHARPE AUTOMATICS
George L. Detterbeck Co.
Formerly Banner Mfg. Co.
1871 Clybourn Ave. :-: Chicago, Ill.

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
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WIREGRIP Belt Hooks —6 sizes of tough hooks conveniently carded. No waste. Makes smooth humpless flexible joint on all flat belts.
STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.
Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

Infra-Red

A battery of 1,368 infra - red lamps helps to speed the drying of electric transformers by doing an hour's job in 8 minutes.

The electric lamps dry transformer tanks from six to eight times as fast as the former method, according to Westinghouse engineers. The lamps are said to be no more expensive to install or maintain than steam heated baking ovens. but have stepped up greatly the production of tanks for distribution transformers. The company has increased its production of such transformers 65% in the last year. These small transformers are an important link in the production of light and power for air fields, munitions plants, naval bases, shipyards, fortifications, army camps and the Panama Canal and for other war purposes.

In the painting process, the transformer tanks are hung by hooks from an endless conveyor chain. Traveling at four feet a minute, the tanks first pass a workman who paints them inside and out in a few seconds with a spray gun. Then the tanks take their eight - minute ride between the two banks of drying lamps where infra-red radiation dries the paint by raising its temperature quickly to about 300° F.

The present installation dries only the base coat of paint. But more lamps and special machinery are being installed to make it possible to spray and dry both base and finish coats in one continuous, 25-minute operation.

The principle on which these lamps do their heating and drying job is as old as the sun itself. The sun emits invisible infra-red heat rays which produce warmth on the earth to make it habitable.

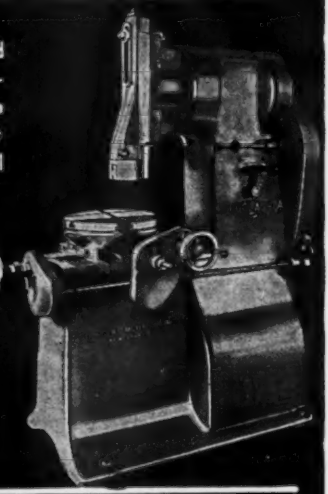
Douglas PRECISION SLOTTER

FOR TOOLROOM AND PRODUCTION

Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.

Prompt Delivery by Large-Scale Production

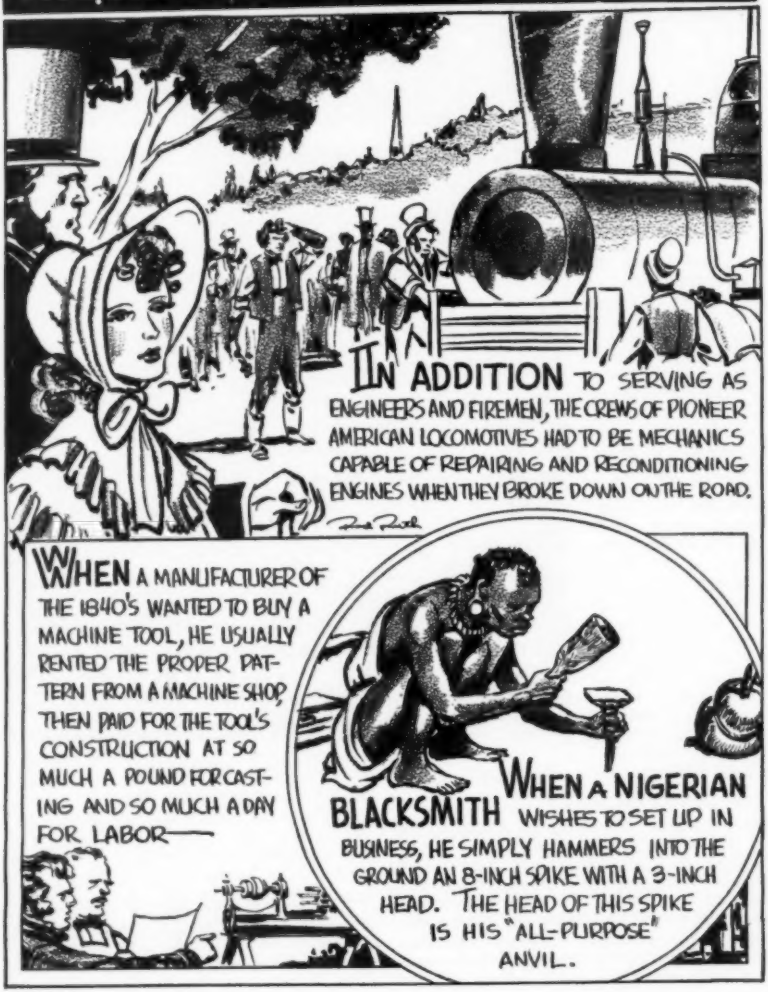
Built with 7", 8", 10" Stroke



DOUGLAS MACHINERY CO., INC.

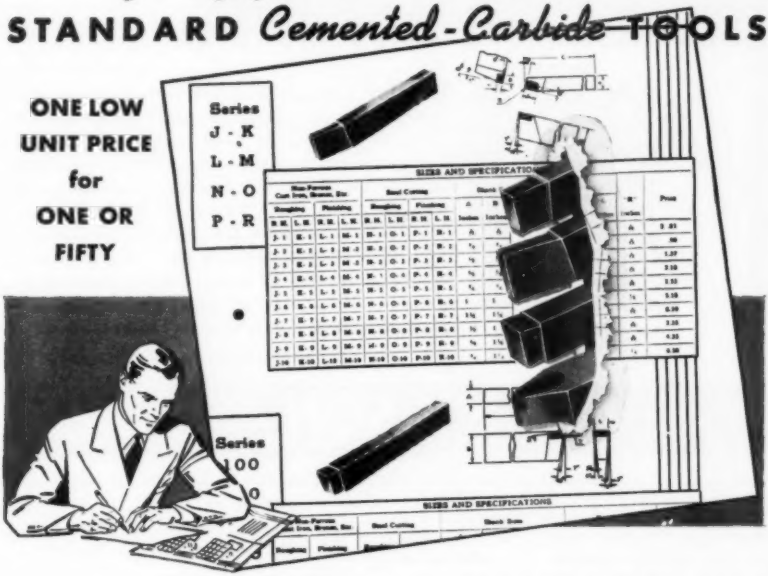
150 BROADWAY, NEW YORK, N. Y., Dept. 8-0C

Mechanics Through the Ages


IN ADDITION TO SERVING AS ENGINEERS AND FIREMEN, THE CREWS OF PIONEER AMERICAN LOCOMOTIVES HAD TO BE MECHANICS CAPABLE OF REPAIRING AND RECONDITIONING ENGINES WHEN THEY BROKE DOWN ON THE ROAD.
WHEN A MANUFACTURER OF THE 1840'S WANTED TO BUY A MACHINE TOOL, HE USUALLY RENTED THE PROPER PATTERN FROM A MACHINE SHOP, THEN PAID FOR THE TOOL'S CONSTRUCTION AT SO MUCH A POUND FOR CASTING AND SO MUCH A DAY FOR LABOR—
WHEN A NIGERIAN BLACKSMITH WISHES TO SET UP IN BUSINESS, HE SIMPLY HAMMERS INTO THE GROUND AN 8-INCH SPIKE WITH A 3-INCH HEAD. THE HEAD OF THIS SPIKE IS HIS "ALL-PURPOSE" ANVIL.

Simplify THE ORDERING OF YOUR STANDARD *Cemented-Carbide* TOOLS

ONE LOW UNIT PRICE for ONE OR FIFTY



THERE's no guesswork . . . no waste of time . . . no chance for error when you order the standard tools manufactured by Carbide Fabricators—the cemented-carbide division of Morse Tool Company. These tools are supplied in four series, each of which is broken down into types for roughing and finishing non-ferrous metals, cast iron, bronze, etc. and for roughing and finishing steel. The price range has been so simplified that the same low unit cost applies to one tool or fifty.

These standard tools are now being produced in large volume in a plant that is equipped entirely for cemented-carbide work. A large stock has been built up and will be maintained to the best of our ability to provide for 24 to 48 hour deliveries.

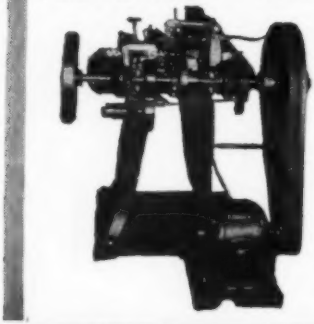
A four-page catalog folder listing all of the standard cemented-carbide tools manufactured by this company gives you *immediately* the exact information you require when ordering. Your order will get prompt attention and you will receive tools which will meet your most exacting production requirements. If you are not already supplied with an adequate number of folders so that every interested person in your plant will have one on hand, be sure to write for them today.

We are authorized suppliers of Carboloy, Firthite, Vascoloy-Ramet and Kennametal cemented-carbides.

Carbide Fabricators DIVISION OF
MORSE TOOL CO.
116 E. GOLDENGATE AVE.
DETROIT, MICHIGAN

DESIGNED FOR HEAVY DUTY

THE NILSON FOUR SLIDE MACHINE



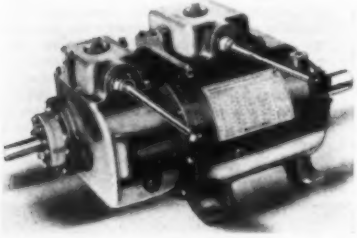
For Swaging, Stamping, Piercing, Blanking, Forming of coiled metal. One of the outstanding features of this combination power press and four slide machine is the powerful and silent action of the main press slide which is operated by crank motion through toggle or knuckle joints. Strength and rigidity achieved by overhead stay rods. Changing dies is a simple and quick operation as the removable die set is easily accessible. The gripping members are independently operated, insuring a positive pull on long or short lengths direct from the reel.

Write for further information.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

A Super Transmission

A new Western Super transmission with 30 h. p., capacity for motorizing cone driven machine tools is announced by Western Mfg. Co., 3428 Scotten Ave., Detroit, Mich.



It is suitable for replacement of gear boxes on large boring mills, radial drills, etc. and can be used to motorize large slotters, engine and turret lathes.

The new transmission has eight changes of speed in geometric progression of 1.29—maximum reduction of 6 to 1.

All gears and shafts are of alloy steel, heat treated. Shafts run on anti-friction bearings. Case is amply provided with oil seals.

The Western line of transmissions now comprises three models which will take care of motorizing machine tool equipment from 1 to 30 h. p.

All three models are adapted to all kinds of machine tools with three models of Multi Motor Mounting: 1. Lathe Bracket, also for motorizing automatics, bolt cutters, Fellows gear shapers, vertical milling machines, radial drills, turret lathes, screw machines, etc. 2. Shaper Bracket also for boring mills, vertical mills, etc. 3. Milling Machine Bracket.

Weltronic Industrial Rectifiers

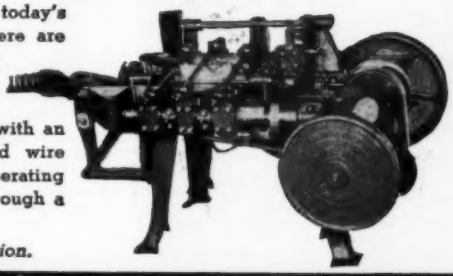
A complete line of full-wave industrial rectifiers, in 11 models, is an-

BUILT FOR SPEED-DURABILITY

THE NILSON-AUTOMATIC METAL AND WIRE FORMING MACHINE

The Nilson Automatic Metal and Wire forming machine meets today's industrial requirements. Here are some of the features of this machine. Open construction of press and forming tools. Patented slide feed with an independent cam - operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information.



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

nounced by Weltronic Corp., E. Outer Drive, Detroit.

The rectifiers are designed for use in the operation of such devices as magnetic chucks, variable speed d. c. motors, switch boards, electroplating installations, circuit breaker reclosing mechanisms, industrial truck and railway car battery chargers, etc.

Two long life high-capacity single plate tubes, one for each half cycle, with a 2000 hour guarantee, are used in the units, which are housed, in turn, in enclosed cabinets designed for wall mounting. A hinged cover is provided for accessibility in replacing tubes.

Installation is simple, a terminal strip being provided for connecting the a. c. input and d. c. output lines. On door of cabinet is mounted an 'off and 'on' switch for controlling operation of rectifier, and an indicating light to show when unit is in operation.

Rectifiers are now available in the following capacities:—100; 250; 500; 750; 1200; 1500; 2000; 3000; 5000; 10,000; and 15,000 Watts.

TINIEST LIGHT SOURCE—The tiniest of practical light sources is a midget Westinghouse lamp slightly larger than a grain of rice. It measures about 3/32 inches in diameter and 3/8 inches long. Surgeons use it to light throat and nasal passages during delicate operations.

Reg. U. S. Pat. Office

UNBRAKO

SELF-LOCKING!
TROUBLE-SAVING!

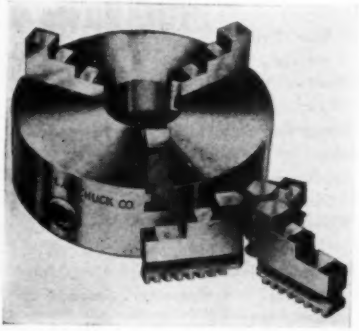
Because of the unique KNURLED cup points, "Unbrako" Self-Lockers take hold with a vibration-defying grip when tightened up with no more than normal pressure. And the Knurled point retains its ability to lock regardless of how often applied. Users report trouble and maintenance saved wherever used . . . why not try them yourself? Write—

The KNURLING of Socket Screws originated with "UNBRAKO" years ago.

STANDARD PRESSED STEEL CO.
BOX 606 JENKINTOWN, PENNA.

L-W 3-Jaw Universals

A new line of 3-jaw universal geared scroll lathe chucks is announced by L-W Chuck Co., 20 N. St. Clair St., Toledo, Ohio.



They are available in four sizes ranging from 6" to 10½", and are readily adaptable for light or heavy duty service.

Bodies are rugged semi-steel castings. Jaws are of steel, hardened and ground, accurately fitted. A set of reversible jaws is furnished. Scroll and pinions are of high grade steel, precision cut. A T-handle wrench is furnished.

The makers guarantee these chucks to run true, and point out that they are desirable for either lathe or screw machine work.

New Turret Lathe Tools

Two new tools for turret lathes are announced by Gisholt. One, an end-facing and forming tool, is used for facing, forming, and chamfering the ends of shafts, studs, bolts, screws, etc. The second, a pointing tool, similar in

construction, provides a quick means of chamfering the ends of such work

pieces for true starting on a single or multiple cutter turner. On each tool the rollers, mounted on needle bearings, are easily set for diameter, and support the work accurately and rigidly. Substitution of a roller support assembly equipped with straight rather than bevel rollers converts the pointing tool into an end facing and forming tool. Both tools may be used for light turning by substituting the proper cutter. Ample cutter room is provided in each case.

For further information write Gisholt Machine Co., 1185 E. Washington Ave., Madison, Wis., specifying make and model of turret lathe.

American Aviation

A World War flying ace, making a report to aviation industry engineers, said recently the U. S. aircraft industry has already surpassed Germany's and predicted that within a year it would surpass the combined output of the rest of the world.

Charles H. ("Carl") Dolan, who is president of the Lafayette Escadrille, made his report as retiring chairman of the aviation division of the A.S.M.E. at the recent annual meeting of the Society. The aviation division elected as Mr. Dolan's successor, Dr. John E. Younger, professor of aeronautical engineering at the University of Maryland, who instituted research on the sealed cabin for aircraft.

Mr. Dolan said that American ingenuity had transformed a "sick cat" into a three-billion dollar industry in a year and a half.

"No industry in this country has ever experienced such tremendous growth in an incredibly short time," Mr. Dolan said.

The aviation industry will surpass the automotive industry in dollar volume, he predicted.

Mr. Dolan is associated with the aviation hydraulics division in Garfield, N. J., of the Chicago Pneumatic Tool Co. Executives of the leading aircraft manufacturers conferred on the problems of management arising from the tremendous growth of the industry at meetings of the aircraft division of the Society in December.

WINNING NEW RECORDS AT

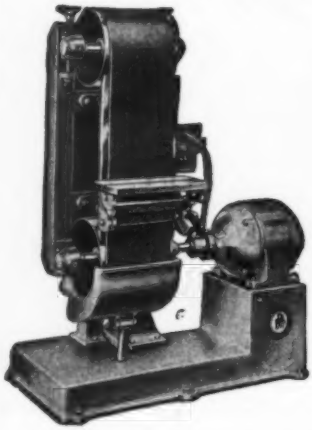
TORPEDO PLANT

Capewell precision-cutting hack saw blades, which have just been adapted by a large Eastern manufacturer, now producing Navy torpedoes, will likewise speed up your production — by cutting faster, lasting longer. Order from your mill supply man.

The Capewell Mfg. Co.
Hartford, Conn., U.S.A.

CAPEWELL

Peerless
SUPERIOR
SURFACERS

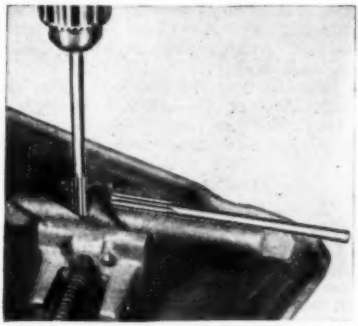


Eliminate costly hand sanding and filing. In many cases, a rapid cut on a Peerless may eliminate an expensive milling or planer operation. The advantages of a straight-grained finish and the economies in time and material resulting from use of the abrasive belt method warrant careful consideration of Peerless Surfacing Machines. 4' to 20' width of belt. Vertical and Horizontal. Also Reed High Speed Sensitive Drills and Greenfield Universal Tool & Cutter Grinders.

PRODUCTION MACHINE CO.
GREENFIELD, MASSACHUSETTS

Reaming Hardened Steel

A new type of reamer, said to be capable of reaming hardened steel of any degree of hardness without annealing, has been developed by the Black Drill Co., 5005 Euclid Ave., Cleveland, Ohio.



The new reamer, made of the same secret-process metal which is used in Hardsteel drills, is designed to operate in the same manner as the drills and is claimed to outlast any high-speed reamer now in use. While the ordinary high-speed reamer will ream metals up to 35 degrees Rockwell, Hardsteel reamers will ream metal of any hardness up to and including nitrided surfaces. It is asserted that no other reamer has ever performed this task.

A noteworthy fact about this operation is that while high-speed reamers used on steel of 35 degrees Rockwell hardness show extremely low tool life, Hardsteel reamers are designed to work in hardened steel of any hardness without unusual wear.

The makers say they have been used successfully on carburized, oil hardened, water hardened, cyanided and nitrided pieces of high carbon, high chrome and high-speed steel.

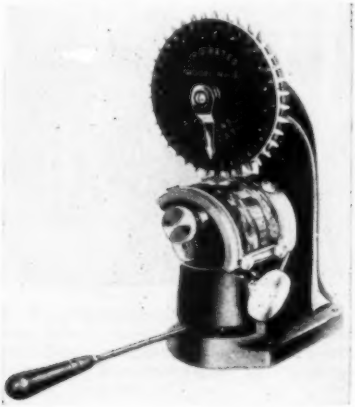
In addition, Hardsteel reamers are claimed to operate successfully in other difficult materials. For instance, they will ream manganese steel without be-

ing affected by this metal's work-hardening qualities, and they will ream cored holes in chilled castings with much higher tool life than high-speed reamers.

The illustration shows a Hardsteel reamer, reaming a hole drilled by a Hardsteel drill in a twist drill of Rockwell 60 C hardness.

Name Plate Stamping Machine

It is reported that aircraft manufacturers have found the new Name Plate Stamping Machine built by the Acromark Corp., 259 North Broad St., Elizabeth, N. J., useful for stamping motor, combustion and wiring specifications on pre-curved cylinder name plates.



The No. 4 hand machine is illustrated. A foot operated machine is also available. To operate, the name plate is placed on the curved holder which advances by a ratchet feed at each stroke of the hand lever or pedal. Faster than hand stamping name plates or parts with a curved surface, the method assures alignment of all characters stamped.

The die wheel is quickly interchangeable for different sizes of dies which may be—1/32", to 3/16" and intermediate sizes.

No. 2 GREENFIELD TOOL AND CUTTER GRINDER

With the variety of attachments available for this machine there is hardly a grinding operation that cannot be handled within its capacity.

The Standard is a separate casting from the base on which it swivels. The extra broad knee is splined to the standard so that the two turn together. By tightening the two lower clamps, a positive vertical feed is obtained. The sleeve of the elevating hand wheel is provided with graduations reading in thousandths of an inch.

The head swivels on the top of the Standard and the rigidity of the two bearings is increased by the tie bar. The sight-feed oilers insure better lubrication and altogether the head will give satisfaction and wear much longer.

PRODUCTION MACHINE CO.
GREENFIELD, MASSACHUSETTS

WE'VE GROWN

6½ TIMES BIGGER

SINCE 1935!

There's basic business virtue in building a better product or we couldn't have increased our plant space 6½ times since 1935. Universal drill bushings have superfinished bores straight and round within .0001 assuring accuracy and unexcelled wearing qualities. Black domes resist rust and improve appearance. All standard sizes available for speedy delivery. Write for facts.

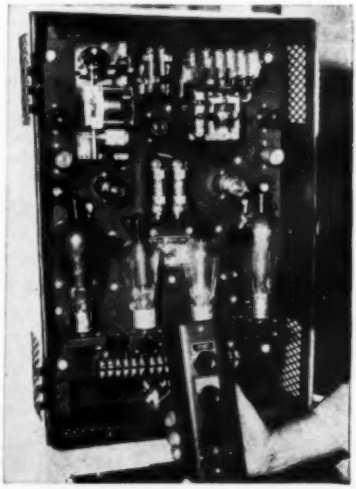
UNIVERSAL

Engineering Company

Frankenmuth, Mich.

G. E. Electronic Motor Control

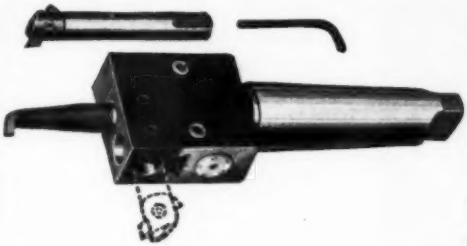
As an outgrowth of its Thyratron speed control for d-c motors, General Electric Co., Schenectady, N. Y., announces a new electronic control system—called Thy-mo-trol—to provide simple, stepless control of d.c. motors from a.c. lines wherever a wide speed range is needed.



With this new development, it is claimed that the flexibility of d.c. motors can now be combined with the economy and convenience of a.c. power distribution. The Thy-mo-trol system leads to simplified machine design, reduced space requirements, and a saving in time over more complex methods of obtaining a wide speed range.

Normally consisting of three separate units—a small control station, a transformer, and a thyratron tube panel—the control provides in one piece of equipment the means for electronically starting, stopping, accelerating, and regulating the speed of a motor. Standard units cover motor sizes up to 5 h.p., 230 volts.

The system provides wide - range speed control without the use of mo-



MASTUR Precision BORING HEAD—

No gib, perfect adjustment, direct reading in thousandths. Vernier reading in two-tenths of a thousandth. Every working part adjustable for wear.

3 SIZES

No. 5—Boring Capacity 7",.....$37.50
No. 6—Boring Capacity 11",..... 65.00
No. 7—Boring Capacity 15",..... 90.00

E-Z SET BORING TOOL

Adjustment actuated by a worm. Made in three sizes.

F. A. MAXWELL COMPANY

300 S. BROADWAY :-: BEDFORD, OHIO

There's No Operation this Machine Won't Handle With Only

ONE WORK SET-UP

No. 7-B RAM TYPE

You can handle every milling, drilling, boring and grinding job—at any angle or compound angle—in horizontal and vertical planes—without changing the work set-up.

Only on a Fray "All-Angle" Milling Machine have you 10 inches of cross travel above the table. The Turret Head is 11½" in diameter, machine calibrated the full 360°.

The Head can be rotated a full 360° in both planes, for any angle or compound angle. The Ram has 10" of in-and-out movement.

Specifications of the FRAY No. 7-B are identical with those of the Fray No. 7, proven by toolmakers all over the world.

FRAY UNIVERSAL MILLING MACHINES

FRAY MACHINE TOOL CO.

501 WINDSOR ROAD • GLENDALE, CALIFORNIA

Save Time
Save Money

By Ordering

CIRCLE TIP

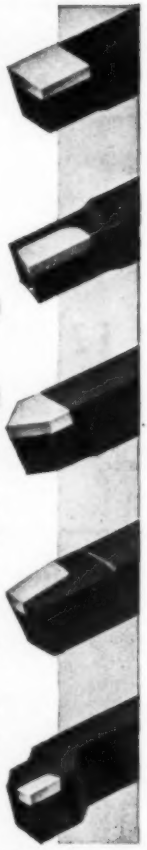
STANDARD

Tungsten Carbide Tip Tools

By ordering *standard* Circle Tip Tools instead of "specials," you can save much valuable time. If you will send us your requirements, we may be able to replace a special tool with one of our standard tools that will give you extra profits in much faster delivery time.

We also carry a complete stock of *standard* Circle Tip Tool Blanks for brazing on your shanks when making your own tools.

Write for catalogues and prices.



CIRCLE TIP TOOL CO.

EAST ORANGE NEW JERSEY

tor-generator sets or gear and pulley arrangements. A single-dial control, mounted in a heavy-duty push-button station, covers the complete speed range of the motor, both above and below basic speed. The motor is automatically accelerated to preset speed quickly and smoothly without excessive current peaks. The same single dial can also be used to change speed to any desired value during operation.

The equipment can be provided for reversing service by the addition of a standard magnetic reversing switch. It can also be furnished with dynamic braking.

In operation, the change from a.c. to d. c. for motor field and armature circuits is accomplished by two pairs of thyratron tubes. The control compensates for changes in armature-voltage-drop, holding motor speed constant regardless of normal-load and line-voltage variations.

The stepless speed control increases armature voltage up to basic speed and weakens the field at speeds above basic. Acceleration is automatic. Full field is held until basic speed is reached and is also automatically applied during dynamic braking.

A thermal overload relay protects motor on sustained overloads. Fuses provide d.c. circuit protection.

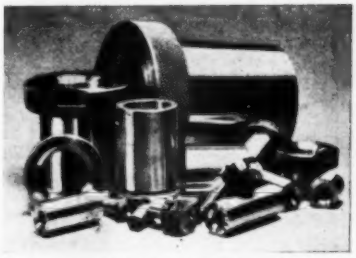
Reeves Machine Tool Drive

Reeves Pulley Co., Columbus, Ind., now offers a motorized variable speed drive for machine tools which eliminates necessity of building a special mounting support or bracket.

It utilizes either the Reeves Vari-Speed Motodrive, or the countershaft type Vari-Speed Motor Pulley. It comprises a symmetrical, compact assembly of constant speed driving motor, variable speed unit and mounting bracket which can be easily and quickly attached to most machine tools by means of four cap screws.

Smooth, quiet, vibrationless transmission of power from drive to driven machine is assured and any speed at all within the limits of the particular unit applied may be obtained by turning a

STANDARDIZED DRILL JIG BUSHINGS



★ The chances are your bushing needs fit into the Acme standard line. Why? Because Acme offers A.S.A. (American Standards Ass'n.) standards, together with Acme standard bushings ... the largest line of standardized bushings available. This reduces special requirements, yet, if your bushing needs are special, Acme is equipped to produce them reasonably fast.

ROTATING SEAL DESIGN... FLAT LAPPING...

Right now, the Acme engineering staff is ready to help with your shaft seal problems ... to improve your present seal, or design a complete new one.;

To obtain the truly mated sealing surfaces necessary for a really tight seal, Acme offers a lapping service that can finish surfaces to within .000005" (Five millionths inch) from absolute flatness. Their strict uniformity abolishes expensive re-assembly and re-testing of your finished product.

ACME ADVICE IS YOURS FOR THE ASKING

ACME INDUSTRIAL COMPANY

Makers Of Hardened And Ground Precision Parts

210 N. Laflin St., Chicago, Ill., MONroe 4122

THE FELL "ALL-WAY" PRECISION LEVEL

NOW USED BY ALL KINDS OF DEFENSE INDUSTRIES AND THE GOVERNMENT SERVICES.

SAVES TIME AND INSURES ACCURACY FOR MACHINE TOOL MAKERS AND USERS

SIZE—5½"x12"
WEIGHT—12½ LB.
GRADUATIONS .0005" PER FOOT

SPECIAL TYPES AVAILABLE FOR PERMANENT MOUNTING.

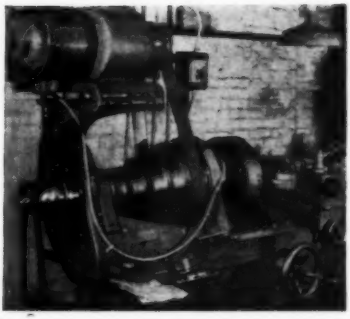
This instrument is specially designed for use in the manufacture and maintenance of precision machines. It is very rigid and durable. The glass is ½" thick and is not sensitive to changes in temperature. Graduations are on the under side of the glass to eliminate error in reading.

WRITE FOR FULL INFORMATION

WM. B. FELL CO., 700 SOUTH ST., ROCKFORD, ILL.

handwheel and without stopping the driven machine.

Motor and variable speed unit are



mounted on a pivoting base at the top of a cast semi-steel bracket. Jack screws in bracket at end opposite speed control unit provide for maintenance of proper belt tension between driving unit and driven pulley on machine. Tension is uniformly maintained at all times by a lock screw.

Two sizes of brackets are available. With the Motodrive, capacities are from ¼ to 10 h. p., depending on size of unit used, and speed ratios from 2:1 through 6:1 are available. Single reduction gear reducer is available if required.

Using the Vari-Speed Motor Pulley, capacities range from ¾ to 7½ h. p. and cover speed ranges of either 2-¾:1 or 3:1 ratio.

Both Motodrive and Vari-Speed Motor Pulley are available for either constant torque or constant horsepower applications, as the job may require. Type of work to be handled, and horsepower and speed ratio required, largely determine the choice of unit to be used.

CAN YOU SEE AROUND A CORNER ?
Inspection of hard-to-get-at places now made certain and accurate with the help of
WAPPLER
INDUSTRIAL TELESCOPES
Write for our Booklet:
"Precision Instruments for the Exacting Inspection of Internal Surfaces."
For prompt action and our recommendations, include drawing of part to be inspected, or preferably the part itself.
AMERICAN CYSTOSCOPE MAKERS, Inc.
FREDERICK C. WAPPLER, Pres.
1241 Lafayette Ave (Bronx) New York, U.S.A.

FOR DEFENSE SAKE

DON'T DISCARD YOUR WORN REAMERS.
WE RESTORE THEM TO
ORIGINAL DIAMETERS
ALL STANDARD HIGH SPEED STEEL
REAMERS WITH STRAIGHT FLUTES
DIAMETERS ½ TO 3 INCHES.
THEY WILL REAM MORE HOLES AND
COST LESS THAN NEW ONES

Abrasive Engineering Corp.
Spring Lake, Michigan

ATLANTIC Band Saws for CONTOUR CUTTING

Packaged in Special Box. Permits easy withdrawal to length desired. 100' lengths.

You can simplify CONTOUR CUTTING by using Atlantic narrow sized blades with one temper only. They are best for cutting any and all metals and are used on all makes of band saw machines.

Send for New ATLANTIC BOOKLET covering our entire line.

ATLANTIC BAND SAWS

Used Coast to Coast

ATLANTIC SAW MFG. CO., INC.
153 BREWERY ST., NEW HAVEN, CONN.

KEEP PRODUCTION UP with **DURO** *Slow Speed* **DRILL PRESSES**

You gain many advantages when you standardize on Duro Slow Speed Drill Presses. Massive construction for extra strength. Balanced and precision made for vibrationless performance. Improved features for easy operation. Highest quality materials for long life.

America is depending on you. Use dependable Duro Presses that will keep your production rolling. Ask for complete details.

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Dept. BB-24 - 2649 N. Kildare
Chicago, Ill.

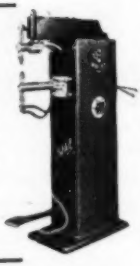
For **DURABILITY** *use* **DUROBILT TOOLS**

ALPHIL
Spot Welders
More Production Lower Cost!

Features include: transformer which guarantees faster heat, stronger welds; water cooled electrodes and tips; automatic trip switch; adjustable arms; swivel pedal; and heat regulator.

If you have any production problems—*consult us.*

Alphil Spot Welding Co.
431 W. Broadway, New York, N.Y.



BREMIL MFG. COMPANY
1700 Pitts. Ave., Erie, Pa.

ALL-ALLOY compound lever strap cutter. Cuts 1½ strap with one stroke.

SPEED-UP YOUR RIVETING OPERATIONS

A great help in Defense Production, these **Grant** Riveters are available in Noiseless Spinning and Vibrating Hammer types, also Vertical and Horizontal Multiple Spindle Spinning Machines. *Information? Write!*

THE GRANT MFG. & MACHINE CO.
C. E. Station, Bridgeport, Conn.

Peco Offers New Aircraft Tools

Developed for aircraft but applicable to many production, fabrication and assembly jobs, a new line of driving tools is announced by Products Engineering Co., 700 E. Florence Ave., Los Angeles, Cal.

Available in two styles, Wrist Action and Dog-leg Action, these Peco Speedrivers have five distinct tips for burring, countersinking and driving which may be snapped in or out in a second's time, making them multi-utility tools.

Peco Speedrivers are so balanced, according to the manufacturer that a smooth, nonslipping action is assured at all times.

Said to be one hundred per cent forged for precision and strength, and designed particularly for aircraft riveting, a new type of rivet sets is also announced.

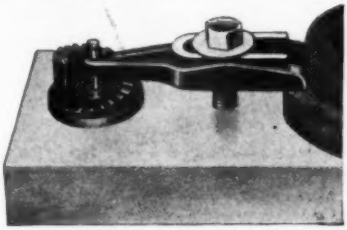
Available in two types, for Flush Riveting or for Standard Brazier and Round Head Riveting, these new Peco Rivet Sets are said to be ground to rigid specifications of shanks and faces.

According to the manufacturer, Peco Flush Rivet Sets have a face design that eliminates dishing and marring of skins and surfaces while the Standing Rivet Sets are designed to avoid ringing and marking when tipped to angles up to 7 degrees.

Reduce Set-Up Time — Speed Production

WITH K-O ADJUSTABLE U-CLAMPS

Turning step-elevation base quickly adjusts clamp to work height. Three-point contact assures uniform pressure, strong grip. Made in six sizes —three styles. ***Write today for circular and prices.***



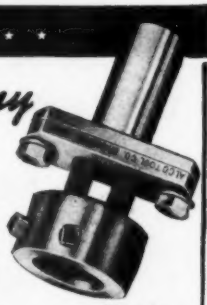
No. 4 U-Clamp with ¾" bolt—$1.25. Discounts for quantities.

K-O PRODUCTS CO. BENTON HARBOR, MICH.

DEFENSE MEANS . . .

Speed • Efficiency • Economy

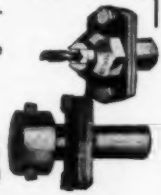
ALCO BUTTON TYPE DIE HOLDERS
give all three



The adjustable concentric alignment feature of the Alco Button Type Die Holder speeds set-up. Correct alignment of die means perfect threads—eliminates costly discards—minimizes inspection. Simple to use. Tighten the die in the die cap—run the die slowly on the work for correct alignment—tighten the two studs and you are ready to turn out work faster and more efficiently than ever before.

Alco equipped machines are efficient defense machines.

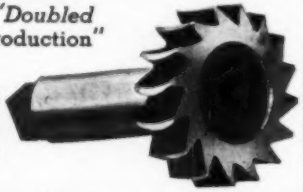
Write for Illustrated catalog



THE ALCO TOOL CO.
835 Housatonic Ave., Bridgeport, Conn.
Detroit Office; 908 Stephenson Bldg.

ALCO EFFICIENT TOOLS

The *New* Aber
Curved Tooth
WOODRUFF KEYWAY CUTTER
"Doubled Production"
according to reports.



Many advantages over old-type keyway cutters:

More cutting edge — Gives shearing cut
Cuts 50% faster — Easy to sharpen
More cuts per sharpening

Full line standard sizes, round or square end shank, in stock. Special size cutters made to order. Territories available.

Circular with prices, on request.

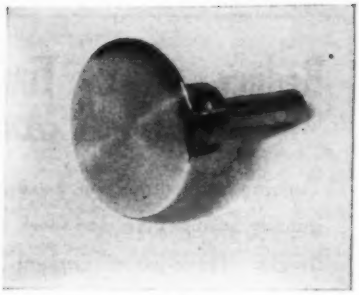
ABER ENGINEERING WORKS
1613 Flett Ave. — Racine, Wisconsin

A SIGN OF *Hospitality*

AMERICAN HOTEL ASSOCIATION
AHA

A SYMBOL OF *Service*

FOR A FRESH START
STOP AT A HOTEL



A catalog on these and other new aircraft tools including forged jig clamps, multi-utility Speedrivers and drill bushings is now available.

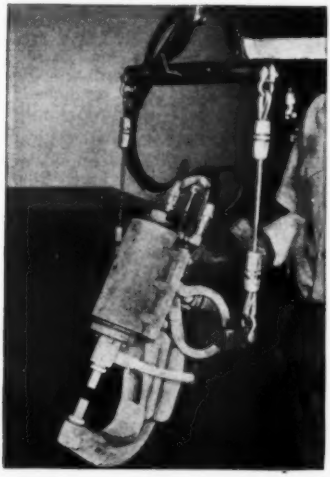
Airplane Engines Develop Electrical Power

The use in packing-houses of "all but the pig's squeal" has long been held up as the ultimate in utilization, but it does not surpass the efficiency of airplane engine manufacture. In the new Ford engine plant, airplane engines are built by the power developed in testing them. Engines for military aircraft are given the shakedown or green run of several hours. They are then torn down, inspected and re-assembled for a final run. Both the green and the final runs are made under load. Under present production schedules, millions of gallons of gasoline are consumed every month in making the tests. In the past the engines dissipated their power into the air by driving special propellers. Not only was this wasteful but it also created problems of noise and heat elimination.

The Ford Motor Co., has installed 16 Westinghouse 1250-kva 720-r. p. m. synchronous generators. Each is connected to an engine through a hydraulic slip coupling, arranged so that when the engine speed exceeds 720-r. p. m., the generator runs at constant speed and delivers power to the plant a. c. bus. Sufficient power is recovered in this manner to supply a large percentage of that needed for the manufacture of the engines.

Portable Welding Gun for Aluminum

For tack welding and assembly welding of sections in fixtures, where the work cannot be taken to stationary pedestal welders, Progressive Welder Co., E. Outer Drive, Detroit, has developed a portable welding gun specifically designed for resistance spot welding of aluminum.



The gun - with its transformer - may be used in combination with virtually any control equipment used for welding of aluminum.

To facilitate production of various shapes of guns for specific manufacturing requirements, the new Progressive gun has all its operating mechanism built into a gun "head," which may be supplied with yokes to fit individual needs.

The new gun is air-operated, employing two differential cylinders in tandem, designed to produce a maximum point pressure of 1200 lbs., when using normal factory airline pressure.

For structural spot welding of aluminum, the gun will handle up to two pieces of .040" thickness. For tack-

ANNOUNCING A NEW, FAST

KIPP air GRINDER

The MODEL H

- HANDIER GRIP
- MORE POWER
- 50,000 R. P. M.

Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them.

Order Today! ONLY $29.75

Please attach preference rating certificate number with order

MADISON-KIPP CORPORATION

207 WAUBESA ST., MADISON, WIS., U. S. A.

"CHAMPION" Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co.
Springfield, Ohio

welding, greater thicknesses may be handled.

Incorporated in gun head is a manually controlled point retracting mechanism, which permits retraction of one electrode to permit clearing of obstructions. The gun has a maximum stroke of 4" and is designed for the application of refrigeration to the welding tips.

Refrigerating units recently developed for this purpose by Progressive are effective in multiplying by several times, the number of welds which can be made before the points need redressing, reducing both tendency toward pick-up and mushrooming.

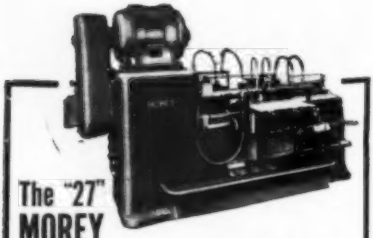
The gun, in operation, is supported on a universal type compensating hanger, permitting positioning at any angle desired.

Plastic Enclosures

A 16-page booklet for the aviation industry, "Solutions To Your Transparent Enclosure Problems With DuPont 'Lucite'," has been issued by the DuPont Plastics Department.

The Booklet tells how transparent plastics sections for airplanes are fabricated, describes in detail various sections used on many planes, and outlines the physical properties of "Lucite" methyl methacrylate resin.

Copies of the booklet will be sent by the Plastics Department of E. I. Du Pont de Nemours Co. at Arlington, N.J. to executives, business men and engineers who request it on their business letterheads.



The "27" MOREY

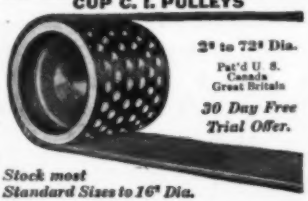
Semi - Automatic Heavy Duty LATHE

Timken taper roller bearings for main spindle—all others anti-friction.

Just the Machine for Shell Work!
Suitable for rough or finished turning shells at maximum feed.
Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.
Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.
Full use of carbide tools can be taken by this heavy duty lathe. *Ask for Circular No. 715.*

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

NO BELT SLIPS WITH VACUUM CUP C. I. PULLEYS



2" to 72" Dia.
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30 Day Free Trial Offer.
Stock most Standard Sizes to 16" Dia.

Shut Off Expense Caused by Slippage
You Save Money on Every Installation

NEW LOW PRICED PRODUCTION LINE
SOME OF SIZES LISTED BELOW **Send for List—On the Shelf**

Dia.	Face	Price	Dia.	Face	Price
2	"x2½"—	$1.25	4	"x3½"—	$2.85
2½	"x2½"—	1.45	4½	"x5½"—	3.95
3	"x3½"—	2.25	5	"x4½"—	4.25
3½	"x3½"—	2.55	6	"x5 "—	4.75

Increase your Production

We supply Fractional Dia. and Face Pulleys—From large casting stock.

VACUUM CUP METAL PULLEY CO., INC.
12535 Grand River Ave., Detroit, Mich.

Flexible Coupling

The National Electric Manufacturers Co., 60 East 42nd St., New York, N. Y. have developed a novel flexible coupling.

It is decidedly simple in construction, using a four layer high carbon Swedish piano wire flexible core, which is fused

by high pressure into metal butt ends with various size bores. The axial misalignment non-parallelism and angularity are governed by the length of core between the butt ends.

No assembling is necessary. There are no movable parts. Couplings are made in sizes for ¼ to 25 h. p. motors.

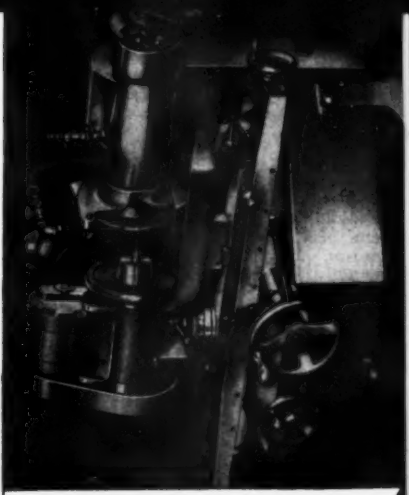
Holder Gauge for Grinding Threading Tools

A new master gauge, said to position thread cutting tools at the proper angle while being ground on any type of surface grinder, is announced.

It consists of a one-piece hardened steel base, milled and slotted to position, and holds thread cutting tools at the proper angles on the grinding surface as required for standard thread cutting operations. The tool bit is held down tightly within the slot by means of two knurled head screws. A set screw takes up any lateral motion which may occur.

The gauge is said to be fool-proof, enabling anyone to grind thread cutting tools on a surface grinder with greater accuracy than any mechanic can obtain grinding by free hand, thereby permitting skilled machine operators to spend more time at productive work. The manufacturer states that the new unit departs from conventional gauges, in that continuous testing is eliminated. Moreover, because grinding operations are limited to fixed angles, uniformity avoids regrinding to account for savings of tool steel.

Complete details and new descriptive literature are obtainable by writing to Acro Tool & Die Works, 2830 West Montrose Ave., Chicago, Ill.



GRENBY PRECISION GRINDERS

Can you hold close tolerances at a production rate? Manufacturers from coast to coast have found GRENBY BENCH GRINDERS the answer to their small precision grinding problems.

GRENBY BENCH GRINDERS have been engineered for this type of work

The GRENBY line includes Internal, External, Flute, Cutter and Surface Grinders.

Send for the GRENBY catalog.

GRENBY MANUFACTURING COMPANY

PLAINVILLE, CONN.

Ekstrom-Carlson No. 5V Vertimil

The 5V Vertimil proffers what is described as a combination five-way feature. By that is meant first, a Ram-Type head; second, a swivel head; third, a sliding spindle; fourth, a swivel table; and fifth, a four-way power feed mechanism. In addition it provides an unusually large capacity, allowing for a wide range of potential uses.

Machine consists essentially of a base and column casting, a horizontally adjustable ram which is mounted on column and arranged to support a swivel sliding spindle head and spindle drive, and a tilting work table mounted on a saddle and knee assembly arranged to provide longitudinal, cross, and vertical movement of the table—all of which are power driven. All operating controls are placed conveniently in front of machine.

The upper bore supports spindle drive gears while lower bore acts as a guide bearing for spindle sleeve. Spindle is provided with a positive action spindle lock with large bearing surface which may be tightened without distortion of head. Flange on head casting is graduated in degrees with zero position located when head is in true vertical position. Provision has been made for tilting head to either side of machine by a suitable worm and worm gear, located within ram and operated by a removable hand crank.

The six-splined spindle slides in a broached sleeve and is mounted between a series of five heavy duty precision bearings of the radial thrust type. All bearings are fully protected from dirt or foreign matter and are provided with forced lubrication. Spin-

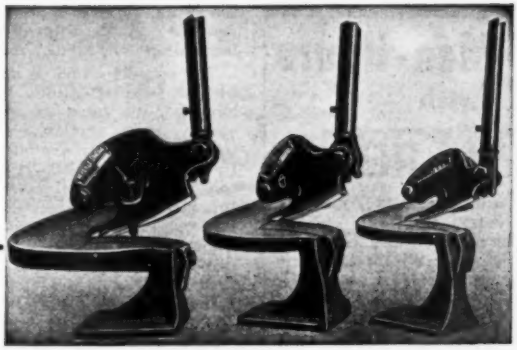
Something NEW in Surface Plates

At remarkably low prices you can now get these new Delta Surface Plates offering features never before available in plates of this type. They are precision ground to close limits . . . all edges are machined square with each other and with the face . . . they have wide ledges all around for clamping work, angle plates, vises, etc. . . . and are of massive construction with heavy ribbing to prevent warping. Ideal for layout work . . . simple to convert into precision plates, if desired, by handscraping to each other or master plates. Far superior to makeshift plates. Order from

The DELTA MANUFACTURING CO., 603A E. Vienna Ave., Milwaukee, Wis.

TWO SIZES: No. 640—15"x18" at $16.00; No. 641—16"x22" at $23.50. Immediate delivery.

SPEEDS UP THE JOB



CUTS METAL ANY SHAPE

BEVERLY Throatless SHEAR . . . Ideal Bench Type!

Just the thing to speed-up those vital Defense Orders! Cuts metal any shape with hair-line accuracy! No distortion! Precision workmanship and finest steel make BEVERLY last a lifetime! Investigate these efficient bench-type shears, today!

Made in 3 Sizes

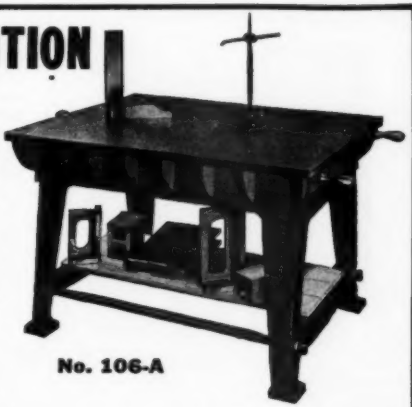
No. 1 — cuts 14 gauge — wt. 16½ lbs.
No. 2 — cuts 10 gauge — wt. 33 lbs.
No. 3 — (Equipped with ball bearing hold-down device) cuts 3/16 inch mild steel or 10 gauge stainless — wt. 55 lbs.

BEVERLY SHEAR CO., 3005 W. 110th PLACE CHICAGO, ILLINOIS

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.



No. 106-A

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907
165 SO. BARCLAY ST., MILWAUKEE, WIS.

Save Man-Hours

with

NEU TROL

Every minute counts in America's All-Out Victory Program. Your magnetic chuck operators can save precious time and eliminate many rejects with this modern magnetic chuck control.

NeuTrol speeds release of work piece from chuck—demagnetizes the work as it releases it.

The old "hammer and pry" methods are no longer necessary. Turn the power "Off" and Presto! Lift the work piece off the chuck. NeuTrol saves time — saves chuck faces—saves chance of operator injury. Easily installed on grinders now in service—or manufacturers will build them into new grinding machines if you specify "NeuTrol." Bulletin No. 21 gives full information.

Two types: Motor Controlled for Remote Control—and Manual Controlled for small units. "There's a NeuTrol for every size of chuck."

Write for Complete Information.

Electro-Matic Products Co.

2235-37 North Knox Ave., Chicago, Ill.

dle is mounted in such a manner as to provide vertical movement by either hand or power feed.

The spindle chuck is said to be capable of holding rigidly and free from slippage, the tools under full load. A sturdy, heavy sectioned sleeve nut having 8 threads is provided to draw up the double taper split sleeve on the tool shanks, which may be either of the straight 1" diameter type or with the tanged taper type up to a Morse Taper No. 4. Spindle is arranged to provide 12 speeds, ranging from 36 to 1200 r.p.m. It has feed speeds of .003", .005", and .008" per revolution, both up and down. Spindle has a travel of 8".

The table is 20"x56" with a working surface of 20"x48" and is furnished with four 11/16" T-slots spaced 4½" apart. Tilting member is graduated in degrees, and each 10th degree line numbered to 30° on each side of zero position. Tilting of table is accomplished by means of a suitable worm gear quadrant mounted on tilting member and meshing with a worm supported in lower casting on a keyed operating shaft.

Vertical feed of knee is arranged in progressions from ⅛" to 5¼" per minute.

A protected all-gear drive eliminates belt changes, etc. Gears are heat treated, shaved, lapped and mounted to provide strength and rigidity. Shafts operate in ball bearings of the anti-friction type. Gears are lubricated by splash and force feed.

Base is constructed to provide for an inbuilt coolant system and pump and provision is made for easy cleaning of chips.

The makers emphasize that the combined adjustments of tilting spindle, tilting table and ram type head provide the advantages of several different milling machines in one compact unit. Material savings should result from elimination of unnecessary set-ups. More often than not, only one set-up is all that is required. Operator moves spindle head by loosening two bolts on ram which carries the head to its working position. The head and table can both be tilted and by simple controls

NICHOLSON CONTROL VALVES

are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.

Style J

Style E

Style H

Bulletins on request.

OTHER NICHOLSON PRODUCTS: Mandrels, Arbor Presses, Flexible Couplings, Steel and Stainless Steel Floats, Steam Separators, Steam Traps, Air Separators, Air Traps, Air Vents, Etc.

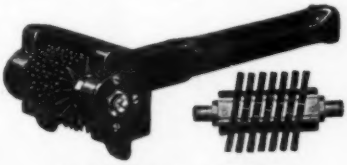
W. H. Nicholson & Company

117 OREGON STREET WILKES-BARRE, PA.

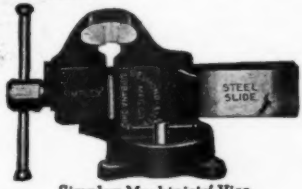
GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.



Desmond Heavy-Duty Dresser



Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

the table can be moved across or longitudinally. With these simple adjustments, the operator can mill flat surfaces, vertical, horizontal or any angle in between.

Standard equipment comprises a 2 h.p. drive motor for spindle, a 1½ h.p. motor for table feed, complete with magnetic starter, overload and under-voltage protection and push button control; one E.C. collet as well as necessary wrenches, etc.

Optional equipment which can be supplied includes: 18" or 21" Rotary Table; Dividing Head; E.C. Quick-Acting Vise Jaws; Dial Indicators; Collets; Cutters; T-slot Bolts, Straps, and Nuts; Vernier Scale; Copying Attachment, and Magnetic Brake.

It is made by Ekstrom-Carlson Co., 1300 R. R. Ave., Rockford, Ill.

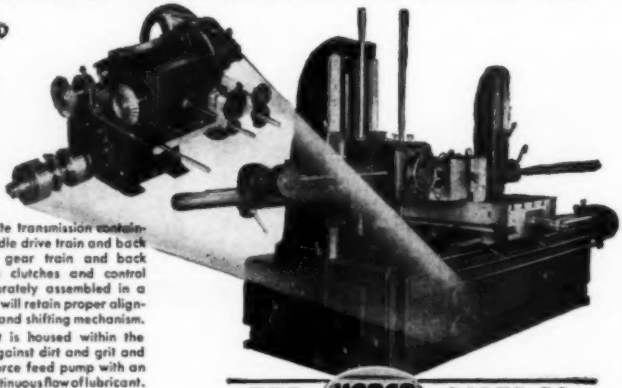
New Model 144 Malldrill

This new drill is extremely light in weight. It is powered for high speed drilling, built to stand up under constant heavy duty operation, and is particularly adapted for use in confined quarters. Over-all length is 8½"—over-all height 7½"—net weight without cord 4½ lbs.—no load speed 4000 r.p.m. In this new ¼" Malldrill the makers claim you will find every feature you want for high speed, constant heavy duty production.

For additional information address the manufacturer, Mall Tool Co., 7742 South Chicago Ave., Chicago, Ill.

ADVANCED BORING MILL DESIGN

IS EMBODIED in this COMPACT DRIVE UNIT



HERE is a complete transmission containing the main spindle drive train and back gears, the feed gear train and back gears, the drive clutches and control shafts — all accurately assembled in a compact unit that will retain proper alignment of all shafts and shifting mechanism.

The entire unit is housed within the base — sealed against dirt and grit and supplied by a force feed pump with an abundant and continuous flow of lubricant.

Write for literature describing other advanced features that make this an exceptional boring mill.

THE YODER SALES CO.
5500 WALWORTH AVENUE
CLEVELAND, OHIO

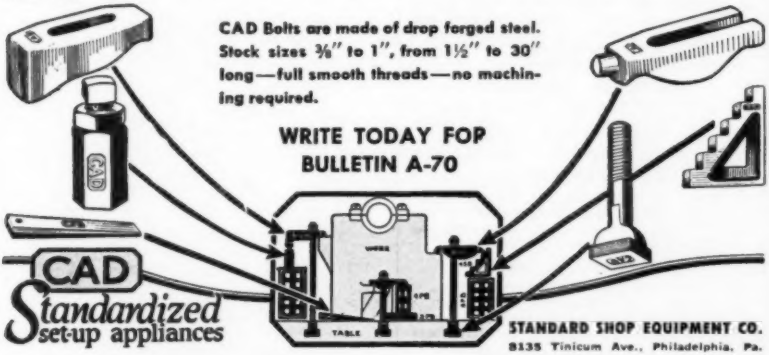
CAD Standardized Set-up Appliances

ARE DEFENSE AGAINST MACHINE SHOP SLOW-UP

Speed up defense work in machine shops by using CAD Equipment. CAD Standardized appliances expedite machine tool set-ups—cut non-productive time to the bone. CAD Bolts *fit* T-slots when ordinary bolts are ruinous. CAD Bolts, clamps, jacks, step-up blocks, wedges, spacers make the set-up job a snap—they save time and money every day.

CARRIED IN STOCK

AKRON, Ohio, Hardware & Supply Co.; BOSTON, Mass., Chase Parker & Co.; BRIDGEPORT, Conn., Hunter & Havens; BUFFALO, N. Y., Beals, McCarthy & Rogers; CHICAGO, Ill., Hibbard, Spencer & Bartlett Co., Samuel Harris & Co.; CINCINNATI, Ohio, E. A. Kinsey Co.; CLEVELAND, Ohio, Cleveland Tool & Supply Co.; DALLAS, Texas, Briggs-Weaver Machinery Co.; DETROIT, Mich., Chas. A. Strelinger Co.; HOLYOKE, Mass., J. Russell & Co.; INDIANAPOLIS, Ind., Vonnegut Hdwe. Co.; LOS ANGELES, Calif., Almquist Bros. & Viets; MILWAUKEE, Wis., Western Iron Stores Co., Harry C. Kettleson, Inc.; MUSKEGON, Mich., Muskegon Hdwe. & Supply Co.; NEWARK, N. J., Squier Schilling & Skiff; NEW YORK, N. Y., Neal & Brinker, Manning Maxwell & Moore; PHILADELPHIA, Pa., Maddock & Co.; PITTSBURGH, Pa., Somers, Fitler & Todd Co.; SAN FRANCISCO, Calif., C. W. Marwedel; SEATTLE, Wash., C. M. Lovested & Co.; ST. LOUIS, Mo., Colcord-Wright Mch. & Sup. Co.; SYRACUSE, N. Y., Syracuse Supply Co.; TOLEDO, Ohio, Bostwick-Braun Co.; TORONTO, Canada, Canadian Fairbanks Morse Co.


CAD Bolts are made of drop forged steel. Stock sizes 3/8" to 1", from 1½" to 30" long—full smooth threads—no machining required.
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Standardized
set-up appliances
STANDARD SHOP EQUIPMENT CO.
8135 Tinicum Ave., Philadelphia, Pa.

Kemifilm Transparent Protective Coating

Although this quick drying coating deposits only approximately a thousandth of an inch film on metal panels by dipping them—tests run by a nationally recognized commercial laboratory report its resistance to rust of over 100 hours in the salt spray box test.

It is a non-porous coating and it is suggested that tests of it be made as a substitute for metallic coatings, slow drying rustproof coatings, and processes requiring much equipment, room and time.

It is almost water white and non-brittle—providing an excellent protective film for hundreds of different applications.

Wayne offers other chemical aids to industry. No-Sep lubricant for taps and cutting tools. Also aluminum lubricants and drawing compounds.

Address Wayne Chemical Products Co., 9446 Copeland St., Detroit, Mich. for full information.

WHAT EVERY PRODUCTION MAN SHOULD KNOW

NEW METHODS FOR IMPROVING PERFORMANCE OF PRESENT EQUIPMENT

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1. AQUA SOL COMPOUNDS and Transparent Grinding Coolants provide better finish — hold to size longer — do not become rancid—chip control by settling or floatation.

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2. OIL AND WATER SOLUBLE — developed to produce lower cost—cooler work—longer tool life—better finish—freedom from odor.

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3. OILS — GREASES — WAXY COATINGS—Black and Transparent Quick-Drying Coatings. A complete line for every purpose and metal.

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4. PASTE SOLDER AND TIN — several grades make possible large savings for many soldering and tinning applications on metals excepting aluminum.

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5. A COMPLETE LINE of oil and water soluble—pigmented and non-pigmented —compounds and oils for drawing—forming and pressing all metals.

WAYNE CHEMICAL PRODUCTS CO.
9446 Copeland Ave., Detroit, Mich.

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Jefferson Hand Milling Machine

A 100-F quick acting hand lever feed Milling Machine, available in floor and bench models, is offered by Jefferson Machine Tool Co., 700 W. Fourth St., Cincinnati, Ohio.

Levers provide longitudinal feed of 8" and cross feed of 3".

Working surface is 14½"x4⅜". Vertical motion of knee is 5¾". Maximum distance from center to table is 5¾". Height overall of the floor type model is 52". Weight (crated) of the bench model is 350 lbs., of the floor type, 500 lbs.

Regular equipment includes draw-in attachment and ½" collet; also 1/3 h.p. 1750 r.p.m. single phase, 110 volt, 60-cycle motor, electric cord for wall plug and drum type forward and reverse control.

The V-belt drive gives spindle speeds of 200, 400, 700 and 1000 r.p.m. Power feed has three step V-belt drive for each spindle speed. Other speeds may be had at additional cost. Variable speed drive is also available for the floor models. Built-in coolant system with motor driven pump and larger catch-basin can also be furnished as an "extra."

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

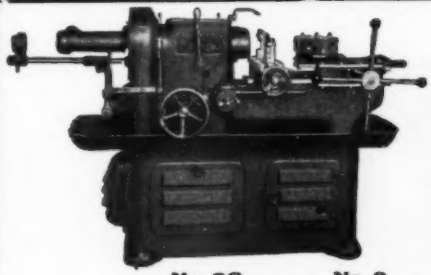
Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

Morey



No. 2G & No. 3
Turret Lathes
Motor Drive
Infinite Spindle Speeds

	No. 2G	No. 3
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 180 to 3600 R.P.M.
CAPACITY	1"x6½" turning length	1½"x9" turning length Made in Plain and Universal Types.
	Ask for Bulletin No. 629	Ask for Bulletin No. 727

Timken taper roller bearings for main spindle—all others anti-friction.

Any spindle speed you want—a direct reading dial shows when you've got it.

Permits the use of carbide tools for fast cutting.

Turret clamps and unclamps automatically.

Equally effective on second operation and chucking work.

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

The swivel vise is 7" long with jaws 1⅛" deep x 3¼" wide. Jaws open 2". Height is 2¾". Base is 4"x7⅝". ½" T-slot handle is provided, arranged for speedy opening and closing. Vise is graduated to obtain the full range up to 360°. A plain vise with jaws of similar dimensions is 5½" long.

Other accessories include a dividing head with an overall length of 6¾", 6" swing diameter and base 3¼"x3". Spindle is equipped with No. 7 B & S taper, and nose is 1⅛" diameter, 12 threads per inch, adapted to receive chuck or work fixture. Tilting dividing head is available—also a vertical head attachment to convert the horizontal machine over for vertical milling operations.

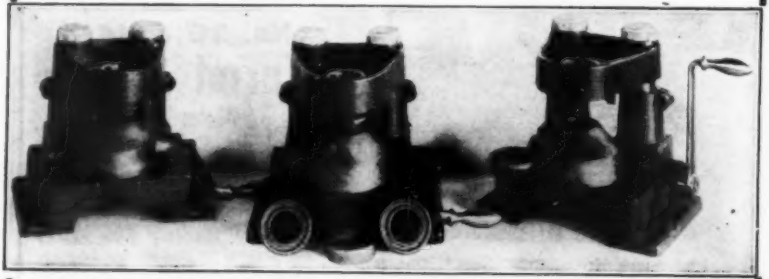
Reid All-Electric Surface Grinder

Reid Brothers Co., Inc., Beverly, Mass., has developed a 6" x 18", all-electric, tool-room surface grinder for which the H. Leach Machinery Co., 387 Charles St., Providence, R. I., is the selling agent. The longitudinal and cross feeds are operated by a ¼-h.p. reversible motor. This feeding arrangement eliminates many mechanical parts and thus insures smoother operation.

A 110-, 220-, 440-, or 550-volt, 25- or 60-cycle, one-, two-, or three-phase motor can be employed to drive the grinder. The table speed is 20 feet per minute. The grinder table is operated by a silent chain instead of a conventional rack-and-pinion gear. All shafts have ball, roller, or Oilite bearings. Both cross-slide and table are equipped with oil rollers to assure longer life. The entire machine is guarded against abrasive dust.

This grinder can be operated either as a hand- or a power-fed machine, and can be changed over quickly from one to the other. A separate switch on the front of the machine permits the operator to employ the spindle by itself, thereby eliminating the motor for the power feed, or by throwing the switch in the opposite direction, he can operate both the spindle and the feeds. The entire machine is equipped with

Let Us Solve Your Drill Jig Problems . . . .

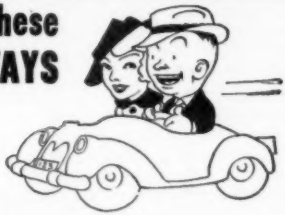


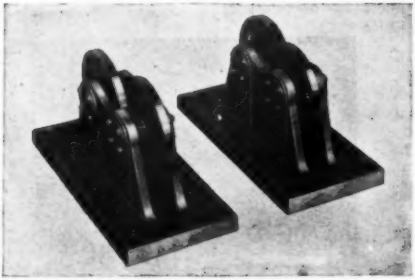
Whether it's Diesel Injectors or Cylinder Heads, we have the experience . . .the modern facilities to equip you with Siewek Rapid Drill Jigs that will pay dividends in time and labor savings on high speed production.

Send for catalog showing our complete line.

THE SIEWEK TOOL COMPANY
FERNDALE, MICHIGAN

You Can Go To Town With These PILLOW BLOCK BALANCING WAYS





Built to give long, faithful service, the Pillow Block type of Balancing Way is especially suited for large diameter work. A sub-base can be made of proper height to give necessary clearance for work.

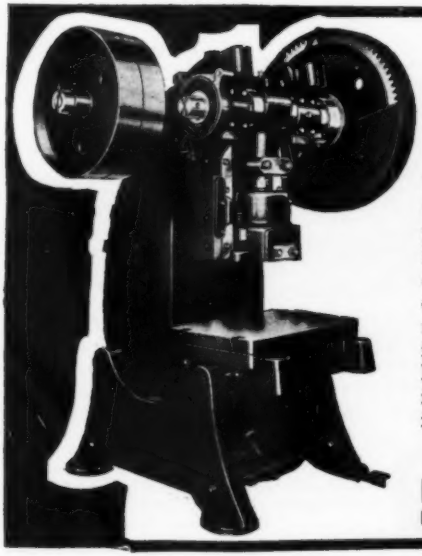
Many leading manufacturers have endorsed them for efficient, static balancing. These Pillow Block Balancing Ways are built in 1000, 2000, 5000, 10.000 and 20,000 pound capacities.

Like all Anderson products, Pillow Block Balancing Ways are precision made.

May we send you more information and details?

ANDERSON BROS. MFG. COMPANY

1907 KISHWAUKEE ST. ROCKFORD, ILL.



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FEDERAL PRESS CO.

ELKHART, INDIANA

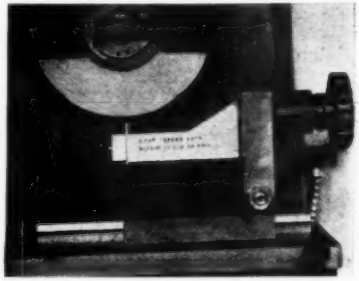
safety switches, making it impossible to jam the machine. The cross-feed is equipped with an automatic knock-off when the machine is operated under the power feed.

The 2-B machine can be equipped with five different types of spindles: The Reid regular spindle, Pope S K F roller-bearing spindle, or the choice of three different motorized spindles. When belt-driven spindles are used, a 1-h.p. motor is required in base of the machine.

C-66 Radius Dresser

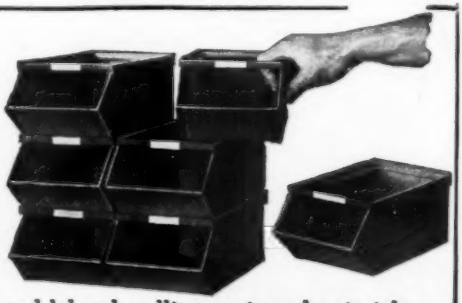
A sturdy attachment for any make of surface grinder, which mounts directly on magnetic chuck and dresses wheel without dismantling machine is offered by Schultz & Anderson Co., 174 Ferry St., Newark, N. J.

The C-66 accurately dresses wheels to both male and female radii. Aside from dressing grinding wheels for different radii, the C-66 can also be used for accurately dressing wheels for radii where a clearance angle on the radius is involved, viz., turning tools. For this work, hinge plate of dresser is set at an angle equal to clearance angle of tool. Wheel is then dressed by rotating diamond back and forth across face of wheel by revolving hand wheel at rear of dresser.



A hood inserted in arm of dresser facilitates the dressing of wheels for accurate radii. Thus, in dressing a wheel for a .250" female radius, the hood is elevated to such a position that

PARTS
where you want them---
when you want them



You'll save time, space and labor handling parts and materials when you use these patented STACKBINS. STACKBINS keep parts instantly accessible—eliminate waste hand motions—stack compactly to form units of exactly the right shape and capacity—make order filling or assembly work faster, easier, more efficient.

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Write today for full story on patented STACKBINS, and learn new lessons in efficiency. Stackbin Corp., 55 Troy St., Providence, R. I.

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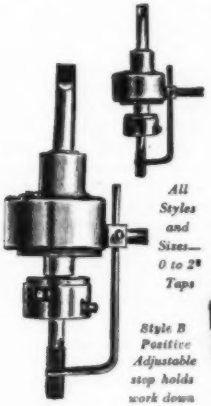
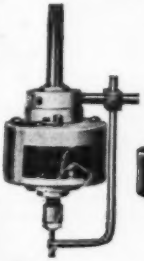
Our High Speed Tappers are Super-Sensitive for Small Tapping

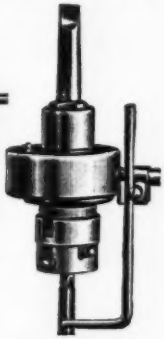


All Styles and Sizes— 0 to 2" Taps

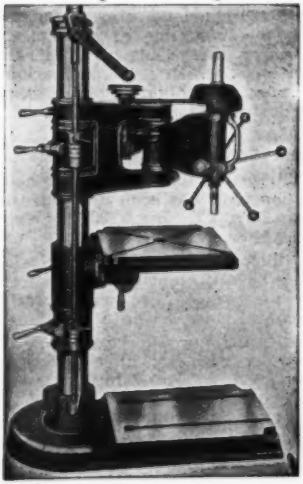
Style B Positive Adjustable stop holds work down

Style D-E, Quick Change Tools





Style C Graduated Adjustable Safety Friction



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40 STOCK SIZES AND MODELS

Production and assembly operations requiring percussion and pressure are done easier, better, faster with FAMCO Presses. There's a model for your need—scientifically engineered for greater capacity, size for size, and trouble-free operation.

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M-B
SUPER-SPEED
Pneumatic
GRINDER
Model SS-SR

Write for Details of FREE TRIAL OFFER

A 100,000 R. P. M. Unit

The only hand grinder with spindle speed of 100,000 R. P. M. on 100 pounds air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand.

Also other models and Air Line Filters and Automatic line lubricators.

M-B PRODUCTS • EXPORT OFFICE
110 E. LARNED ST. DETROIT, MICH. 44 WHITEHALL ST. New York, N.Y. U.S.A.

its under side is .250" above center line of spindle. Hood is then locked in position by set screw in arm. The diamond is then raised until the nib contacts under side of hood and locked with set screw. Hood is then removed and dresser is ready. If there is any clearance angle on the radius, hinge plate is merely set to desired angle. In dressing wheel for a male radius, diamond is set below spindle center line. In all cases the dressing operation is in the open and easy to see.

As it is frequently necessary to dress the wheel for radii of only 90° or exactly 180°, for either male or female radii, settings in the hinge plate are extended to permit only the 90 or 180° rotation desired, for male or female radii. Settings are sustained by spring action, and can be put in or out of use by the pressure of one finger.

The diamond is held in position by pressure of a set screw against a ground Vee in the arm. Vee is an accurately ground groove of 90° included angle, each side of which is at an angle of 45° with end of arm. This construction permits accurate holding of any diamond up to ⅜" diameter in line with the vertical and horizontal center lines of spindle. Diamond also is in line with axial center line of spindle, the axial center line being parallel with edge of base, which is banked against rail of magnetic chuck. Spindle bearing is dustproof.

Genesee Production Tools

An interesting line of multiple blade production tools has been developed by Genesee Mfg. Co., Inc., 139 N. Water St., Rochester, N. Y.

This includes tools for spot facing, finishing bevels, grooving, forming, etc. All of these are made with inserted replaceable blades.

Genesee hollow mills can be fitted with drills, reamers, pilots, etc., for replaceable blades which assures multiple operations.

The high speed steel blades may be removed easily for sharpening or can be replaced at nominal cost. Blades are easily and accurately adjusted within .001".

Economical Live Ball and Roller Bearing Centers are going to play an important part in our National Defense Program.

FOR LATHES, HAND SCREW MACHINES, GRINDERS and MILLS

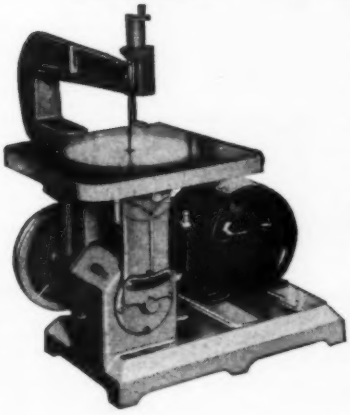
The features that interest you most:

1. Simplicity, sturdiness, and heavy duty.
2. 50% more radial load carrying capacity than the average live center.
3. Large spindle, small head, short overhang, most desirable for rigidity and to be free from chatter.
4. With the aid of cap screw you can lock spindle to redress point right in your machine.
5. Special oil seal to retain lubricant and keep out foreign matter.
6. A compression pad to compensate for heating and expansion of metal as a safety factor, with reasonable diligence exercised.

A folder giving prices and complete detail will be mailed to you upon request.
A ten day trial. If not perfectly satisfied your money will be cheerfully refunded.

MOTOR TOOL MANUFACTURING CO., 12282 TURNER AVE. DETROIT, MICHIGAN

WHY WAIT? NEW ATLAS DIE-FILING MACHINES AVAILABLE FOR IMMEDIATE DELIVERY



Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type of chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast. The ATLAS Die-Filing Machine has every possible advantage for rapid and accurate die-making—AT A BIG SAVING OF LABOR.

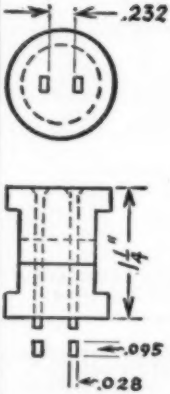
Price, complete with motor— **$125.00** Net

F.O.B. CHICAGO

ATLAS EQUIPMENT COMPANY
103 S. Clinton St., Chicago, Ill.

Punch

don't drill small holes



The occasional replacement of punches in this construction is a minor operation and does not require more than ordinary skill.

Durable Patented Piercing Punches of any shape are held in perfect alignment at all times, and are easy to replace. It helps save time on important jobs in our present national emergency.

In addition to punches for round holes, we are equipped to furnish Durable Patented Piercing Punches in any shape or size.

While the cost of the original installation is slightly greater than for standard construction, the durability and ease of punch replacement, as well as the economy of the punches themselves make this set-up desirable where the quantity justifies.

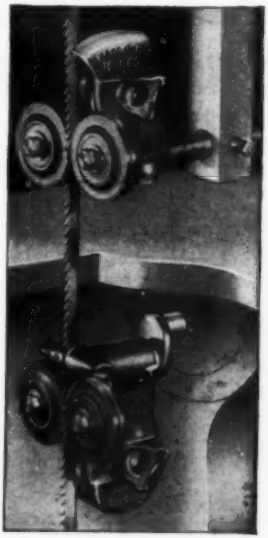
We have assisted many concerns on their piercing problems and shall be glad to answer any inquiries regarding yours.

DURABLE PUNCH & DIE CO.
308 N. Loomis Ave., Chicago, Ill.
EASTERN OFFICE
1257 Commercial Trust Bldg., Philadelphia, Pa.

Ten standard styles are offered. Special tools are made to order. Blueprints or samples are invited for estimates on special tools. A new catalog gives complete information.

Guides Help Bandsaw Performance

All kinds of material are being cut with bandsaw machines today:—wood, metals, dry ice, rubber, fibre, fabric, paper, plastics, etc. Improvements have been made by the manufacturers of the bandsaw machines to adapt them for the new tasks and to take care of the additional work bandsaw machines are now called upon to do. The blade manufacturers have had to improve their blades so that higher speeds could be obtained in many of the new operations. Now it is common practice in some metal cutting operations to employ bandsaw machines with a blade travel of 10,000 f.p.m. Such speed requires good blades.



In all of these speedy bandsaw applications, it is true economy to use

A NEW 20 INCH DRILL PRESS

. . . with smooth, positive POWER FEED

This new Drill Press was designed especially to meet today's extraordinary production needs. Its compact, smooth-acting Power Feed operates through a clutch and can be engaged at any point, regardless of spindle position. Unusually well balanced, it operates with equal precision at speeds as low as 260 r. p. m. and as high as 5200 r.p.m., drilling holes from 1/16" to 1". Study the quality features described in the drawing at extreme right and in specifications below - then mail the coupon for further details.

SPECIFICATIONS

CAPACITY–Drills to center of 20" circle. Feed 6". Drills 3/4" hole in steel, 1" in cast iron.

SPINDLE SPEEDS–With 1140 r.p.m. motor: 260, 520, 800, 1200, 1700 r.p.m. With 1740 r.p.m. motor: 400, 800, 1200, 1800, 2800 r.p.m. With 3450 r.p.m motor 800, 1600, 2400, 3800, 5200 r.p.m. Special 2-speed motor also available for 3-phase only

OVERALL DIMENSIONS – Head, front to back, with guard 32" Width 14". Column 3 3/4" Height (Floor Model) 74" Table working surface 14" x 18".

POWER FEED–Available with or without power feed. This unit, powered from drill press spindle, has positive clutch and sensitive automatic trip and return. Four feeding speeds: .003", .006", .009", .012" per spindle revolution. Positive depth stop.

MODELS–Single and multiple spindle models available with or without power feed. Single spindle drill presses also available with foot feed.

The solid head casting is precision-bored to fit the machined column and quill. Four precision deep-groove ball bearings assure smooth, frictionless operation of spindle. Bearing above and *below* the straddle-mounted pulley take the belt strain evenly, preventing whip.

WALKER-TURNER COMPANY, INC.
1751 Berckman St., Plainfield, N. J.

Send complete specifications and description at once.

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Position .....

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FOR METAL, WOOD AND PLASTICS

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good guides. The old conventional type of guide with its rigid jaws, through which the blade traveled, with frictional wheels grinding against the backs of the blades, is blamed as a direct cause of much blade breakage. All this trouble increases in proportion to the increased blade speed.

When old machines are speeded up, it's advisable to install a good set of guides.

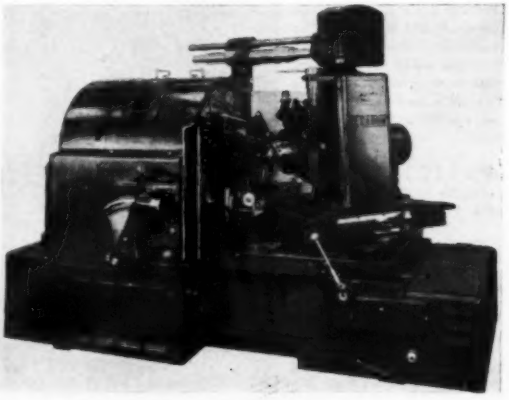
A prominent builder of high speed bandsaw machines has recently announced several new models on which Paddock Ball Bearing Bandsaw Guides are standard equipment.

In Paddock Guides, every point of support given to the blade is a ball bearing wheel that travels in the same direction as the blade, holding the blade firmly. The makers assert that efficiency of the machine is increased—more and better work can be done—much of the blade breakage is eliminated and operation hazard is reduced.

Address Paddock Tool Co., 1418 Walnut St., Kansas City, Mo., for further details.

Gleason No. 17 Hypoid Grinder

With the new No. 17 Hypoid Grinder recently announced by Gleason Works, Rochester, N. Y., the teeth of generated curved-tooth, bevel and hypoid gears and pinions may now be finished rapidly by precision grinding.



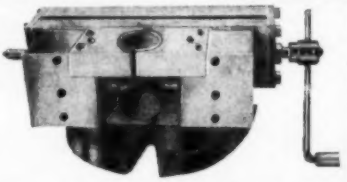
The advantages claimed for ground bevel gears include: — correction of heat-treat distortion, uniformity of all teeth, elimination of surface irregularities, removal of tool marks, and tooth profile and fillet blended smoothly into bottom land.

The generating motion employed on the new grinder is said to be entirely different and combines continuous rotation of work spindle with a reciprocating motion of wheel carrying cradle. This is said to be worked out in such a way as to provide new standards of grinding speeds in a generating grinder.

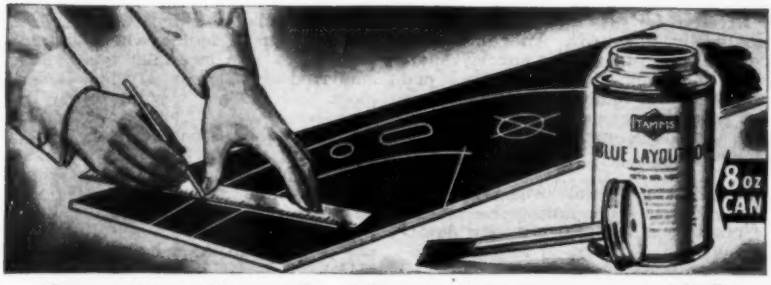
MACHINING OF SPECIAL FITTINGS

Most of your machining such as Drilling and Tapping operations are more easily done and at less tooling costs,

with JOHN'S DRILL JIGS



HEUSER MFG. CO. 1638 N. PAULINA ST., CHICAGO, ILL.



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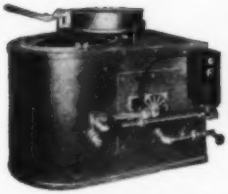
TAMMS BLUE LAYOUT DOPE

Machinists—tool makers—die makers—model makers—sheet metal workers—metal pattern makers—ALL RECOMMEND this modern layout method ! Makes possible clean—accurate detail without chipping, cracking or flaking off. Speeds layout time on brass, aluminum, copper, tin, stainless steel, etc. Comes in handy 8 ounce bench type brush-in cans. Also comes in pints, quarts, gals., 5 gal. cans, and 55 gal. drums. *Write for sample !*

TAMMS SILICA CO. 228 N. LaSalle St., Chicago, Ill.

"NEVER THOUGHT IT POSSIBLE"

Says Bill Sweet . . . President,
Twin City Steel Treating Co., *also instructor,*
Wm. Hood Dunwoody Industrial Institute



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in the heat treatment of low carbon steel, high carbon steel, and alloy steel parts . . . aluminum alloy, magnesium alloy, brass and other non-ferrous castings, forgings, sheets and shapes with DESPATCH FURNACES . . . temperature range 2750 F. to 12500 F.

Write today for new Bulletin No. 81-C containing details of improved features for all types of material handling, photographs of recent installations and diagram of heat dynamics for either gas or electrically heated Despatch furnaces.

DESPATCH OVEN COMPANY

MINNEAPOLIS MINNESOTA

Dressers for grinding wheel are hydraulically operated. After operating control lever, dressing is entirely automatic including advance of wheel, and side, end, and radius dressing. Dressers are completely adjustable for feed, pressure angle, radius, and wheel diameter.

In grinding a gear, wheel is alternately fed to work during the up-roll of cradle and withdrawn during down-roll of cradle. Work, in meantime, rotates continuously so that wheel, when starting on next up-roll, engages a following tooth. This cycle is repeated until all teeth are ground, at which time machine automatically stops. Hydraulic movement of sliding base to and from cutting position and a new-type hydraulic chuck provide speed and ease in changing work.

Control of tooth bearing is obtained by dressing wheel to a modified shape and by modifying generating roll. Change gears control indexing from tooth to tooth and wheel speed, while cams control generating roll and feed. The cup-type grinding wheel is comparable to the face-mill type cutter employed on Gleason Hypoid Generators.

Specifications:—cone distance, 12½" maximum; pitch, 2½ D.P. coarsest; whole depth, ¾" maximum; face width, 2½" maximum; ratio, 1 to 1—4½ to 1 with shafts at 90°; wheel diameters, 5¾" to 13½"; feeds, 1.9 to 11.8 seconds per pass per tooth; floor space, 65¾"x 111¾".

Jackson Offers New Electrode Holder

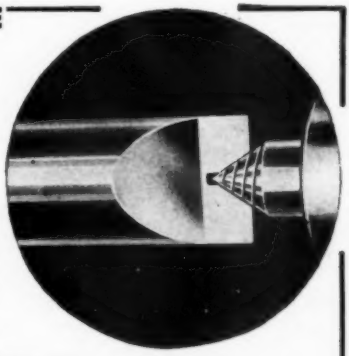
Jackson Products, Detroit, Mich., announce a change in design of their electric arc welding electrode holder to include a rod bender. Welders now have a quick, convenient means for preparing the rod for use. The result is faster welding. The Jackson Line includes 10 fully and semi-insulated models, ranging in capacity from 200 to 500 Amps.

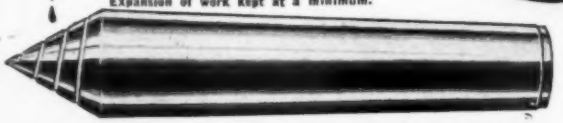
CMD -- HELICAL GROOVE

LATHE CENTER

When used with CMD Lathe Center Point Lubricants has an operating Ratio of from 15 to 1 running time over the conventional TYPE OF LATHE CENTER

CMD Helical groove center expels heat from work caused by cutting tools — conveys center lubricant to extreme point of work and center — Lubricates entire bearing surface of work and center — No stopping of lathe to relubricate the center — No readjustment of tail stock necessary — No dripping or crushing out lubricant — Frictional heats reduced — Expansion of work kept at a minimum.





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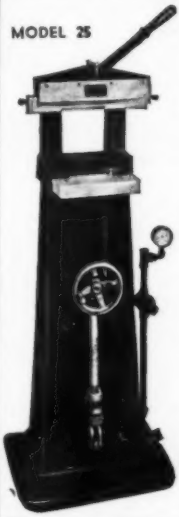
CHICAGO MANUFACTURING AND DISTRIBUTING CO.

1942 W. 46th ST., CHICAGO, ILLINOIS

MODEL 25



MARK YOUR PARTS

Permanently

PART NUMBERS, CATALOG NUMBERS,
HEAT NUMBERS, SERIAL NUMBERS,
PATENT NUMBERS
MANUFACTURER—INSTRUCTION DATA—INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME.

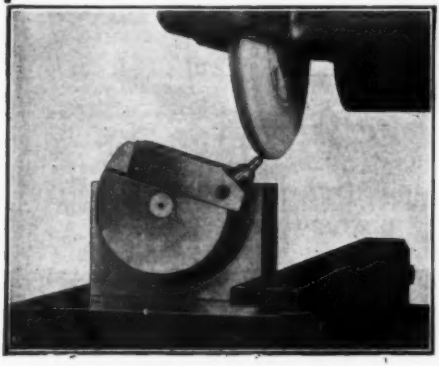
Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

GEO. T. SCHMIDT, Inc.

1802 Belle Plaine Ave., Chicago, Ill.

Speedy!

The WELCH Quick Angle Dresser speeds up the accurate dressing of grinding wheels to any required angle. It is quick and easy to use . . . accurate and precise in the results obtained.



Precise

The WELCH Quick Angle Dresser is available in plain or vernier types. Revolving dial on the plain type is graduated in degrees and the zero line is on the base block.

Vernier type has the same graduated revolving dial, with vernier cut into the base block. This is an unusual feature and precludes possibility of the vernier being moved.

After setting dresser to the required angle, tighten knurled hand knob and dresser is ready for use.

Vernier type dresser, complete with one diamond $82.50

Write TODAY for full information and prices.

Welch Industries Incorporated
Makers of HIGH SPEED MILLING CUTTERS FORM TOOLS and SPECIAL TOOLS
19900 W. Eight Mile Road
DETROIT, MICHIGAN

The Dillon Thermometer

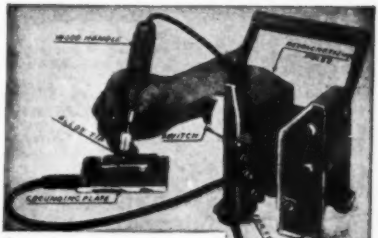
An unbreakable metal thermometer is offered by W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago. Developed originally for measuring solder temperatures, the instrument is rugged yet light in weight. The dial is easy to read, being 2⅛" in diameter. Tube is ¾" in diameter and 9" long.

The dial is calibrated from 150 to 1000° F. Also can be supplied with dial calibrated from 65 to 500° C. Temperature readings are accomplished in a few seconds by dipping end of tube two or three times into solution being heated, holding it in the last time while reading the dial.

P. I. V. Gear Catalog

Link-Belt Co., 2045 W. Hunting Park Ave. Philadelphia, has issued a new, 52-page catalog and data book No. 1874 on the Link-Belt P. I. V. Gear variable speed transmission—its positive, infinitely variable all-metal chain gear.

Units of ½ to 15 h.p., capacity with speed ratios of up to 6 to 1 are tabulated, illustrated, described. Speeds, torque ratings, dimensions, weights, and other data are given for all seven sizes, each available in five standard types, horizontal and vertical mountings. Many pictures of actual installations throughout the industries are shown.



RED HEAD

ETCHERS and DEMAGNETIZERS

Let us tell you the many advantages of our new D. C. and A. C. models now available. Also, see our new line of Midget Chucks.

Send TODAY for latest circulars

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14595 KENTUCKY AVE.,
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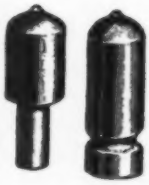


FOR DEFENSE

KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE

DIAMOND POINTED EMERY WHEEL DRESSERS

¼ KT. TO 10 KT.

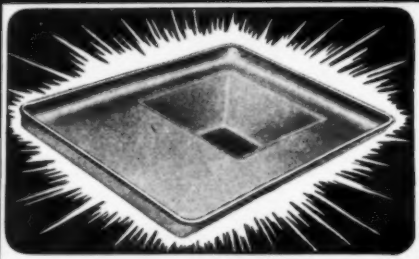
IMMEDIATE SHIPMENT

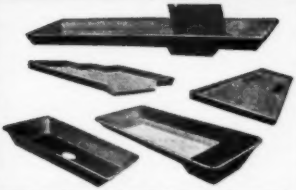
Send for Prices ***Specify Holder***

"If its made of Diamond—Ask us First."

E. KARELSEN, INC. *Established 1852* 58 W. 45th St., New York, N. Y. Tel. VAN. 6-5688

LATHE PANS





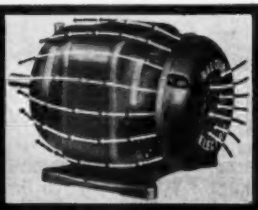
Speed up your production by using precision made Lathe Pans delivered to your plant ready to install. Why tie up parts of your plant when you can secure low cost Pans made in a plant set up for this work. Any size or shape can be made with accuracy.

Send your blueprints for prices, today!

LITTLEFORD

LITTLEFORD BROS.
435 E. Pearl St.
Cincinnati, Ohio

NEWEST DESIGN
Cool-running
MOTOR



Illustrating forced air-movement over entire exterior of motor frame.

BALDOR Streamcooled Design provides a totally-enclosed, ball-bearing motor with an unfailing, NON-CLOGGING cooling system.
BALDOR Glass-insulated motors withstand higher temperatures SAFELY and provide MORE H.P. in smaller frame sizes.
These and many other features at NO EXTRA COST to you.

BALDOR

Write for Bulletin

BALDOR ELECTRIC CO.
4368 Duncan Ave., ST. LOUIS, MO.

BETTER MOTORS

No. 3 Wigglesworth Milling Machine

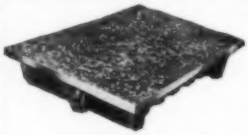
The Wigglesworth Machine Tool Co., 191 Bent St., Cambridge, Mass., announce a new small Horizontal Milling Machine.

It is said to combine the usual features of the conventional hand miller with the ruggedness and accuracy of a larger machine.

Longitudinal movement of table is either by rack and lever, or worm which is automatic. Power longitudinal feed of table is of improved design and is extremely powerful, giving 6 different rates of feed. The transverse feed is by screw, and all feed screws have large, legible dials. Vertical movement of knee is obtained by a screw, or by rack and lever for quick action.

Motor is mounted in base, and drives to spindle through an intermediate shaft by "V" belts, giving 6 different spindle speeds.

Spindle is mounted on two precision Timken tapered roller bearings. Spindle nose is fitted with No. 9 B. & S. taper.



SURFACE PLATES

HAND SCRAPED - SEASONED CASTINGS

TOLERANCE .0003"

SIZE	PRICES	NET WGHTS.
8x12	$ 25.00	20 lbs.
9x14	28.00	30 lbs.
10x15	34.00	45 lbs.
12x12	32 00	41 lbs.
12x18	51.00	60 lbs.
18x18	75.00	100 lbs.
18x24	98.00	143 lbs.
18x36	132.00	250 lbs.
24x36	198.00	350 lbs.
24x48	278.00	525 lbs.
30x60	445.00	900 lbs.
36x60	590.00	940 lbs.

Prices on other sizes upon application

Prices subject to change without notice

GOOD DELIVERIES ON MOST SIZES

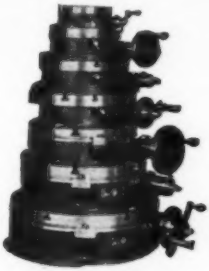
NET PRICES INCLUDE COVER AND HANDLES

Our Surface Plates are made of a very close grained, high strength dried sand cast iron of high wear resistance, thoroughly seasoned. Deflection, which might be caused by the weight of the piece being tested is prevented by the deep ribs supporting the plate, thus giving it rigidity and stiffness.

Accuracy of the scraped surfaces is maintained by careful hand scraping and checking against master plates of known accuracy.

ACME TOOL COMPANY

125 CHURCH ST. NEW YORK, N. Y.



Troyke Rotary Tables

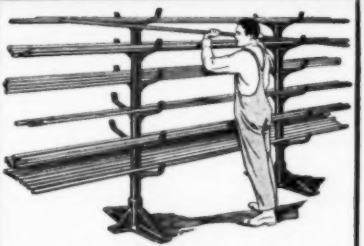
Sizes 9" to 25"

Ask your dealer or write us for [eight page catalog.

ALFRED A. TROYKE

4422 Appleton St., Cincinnati, O.

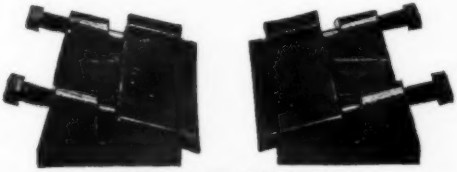
A TIME SAVER



The BROWN SECTIONAL RACK saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

SEND FOR BULLETIN No. 26-B.

BROWN ENGINEERING CO. 126 N. THIRD ST. READING, PA.



HART'S
Divided Machine Vises

These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The Jaws are tool steel and hardened, the angle holding the work down on the table.

Size of Base	**5x7 inches**
Size of Jaw	**3x6 inches**
Height at highest Point	**2¾ inches**

When writing for descriptive circular kindly mention the BLUE BOOK.

HART MACHINE CO.

26 Mather Street, · Dorchester, Boston, Mass.

HART'S
Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

Table is 7"x20" with oil pockets at either end, and three "T" slots. Range is:—longitudinal 20", transverse 5-½", vertical 10".

Column is of one piece box section casting with broad and adequate slide for the knee cast integral.

Standard equipment includes—1 h. p. motor and switch, arbor support, oil pot, wrenches and power longitudinal feed.

DIAMONDS for Defense

BIG-HED Loc-Key-Set Diamond Nibs provide cooler dressing, permit closer tolerances. For best results we recommend 1 karat for each 7" dia. of wheel. Three grades of diamonds . . . Common, Medium and Select. Prices per karat: $12, $24 and $36. Contour template diamonds supplied only in Medium and Select grades. D.T.Co. Nibs are carried in stock. 24 hr. re-setting service, $1.00 Postpaid.

New Loc-Key-Set feature of BIG-HED Diamond Nibs permits micrometer control of diamond pass. Unique internal key construction absolutely prevents turning or shifting of diamond slug. Diamonds in sizes from ¼ to 10 Karats. Orders shipped promptly. Billed subject to approval. When ordering, specify wheel dia. and grade.

FAT. PEND.

BIG-HED

DIAMOND TOOL CO., Not Inc.
938 E. 41st Street CHICAGO, ILL.

Hunter Tool and Cutter Grinder

A new Tool and Cutter Grinder (Model 101-000) has recently been developed by Hunter Engineering Co., Riverside, Cal.

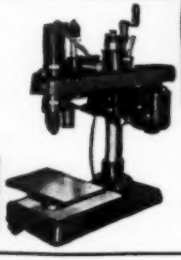
Swing over table is given as 8" dia.; length between centers, 15"; length between tailstock and work head is 15"; face mills on work head 8" dia.; face saws on table 28" dia. and formed cutters (using 6" wheel) 6" dia. Table surface is 3½"x26".

Longitudinal movement of table is 14"; cross movement of table, 5"; and the table swivels 180°. Table gradua-

for the NEW YEAR

SAVE WEAR AND TEAR ON YOUR SMALL DRILLS AND TAPS—USE HAMILTON DRILLING AND TAPPING MACHINES.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO



The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

for small holes .004" to .250" diameter.

Meet 1942 prepared to cope with conditions... with better production, more economically.

THE SHAPE-RITE HY-DUTY 8" STROKE PRECISION SHAPER

is furnished with table support, helical gears, Vee-ram, and anti-friction bearings throughout.
America's All-Out Victory Program demands speedy, efficient, accurate machines. These sturdy, rigid units meet every requirement.

Sales Service & Mfg. Co.
473 - N. Cleveland - St. Paul, Minn.

Longer life for CARBIDE TIPPED TOOLS

with this wet or dry

STANDARD GRINDER

This substantial precision grinder provides great economy by removing less metal from carbide tipped tools and gives keener edge in less time.

While each wheel is equipped with wet grinding attachment, a separate toggle switch operates motor driven pump permitting dry grinding. Drum reversing switch included. Manufactured in three sizes: 1 HP for 10" wheels; 2 HP 12", both with 1750 RPM motor; 3 HP 14" with 1150 RPM motor. These grinders use either cup or steel back cylindrical wheels.

Write for Catalog 43.

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI, O.
WEST EIGHTH ST.

Over production let-down with Colwell tool-post Turrets. Speeds up production—fits lathes from 9" to 20". Send today for new Folder and Price list.

S. G. Colwell
25 Congress Avenue
Providence, Rhode Island

tions on end provide for taper of 2" per ft. Table graduations in center in degrees — 90°; vertical movement of grinding wheel spindle is 10"; swivel movement of grinding wheel spindle is 360° and maximum distance, center line spindle to top of table is 10".

Spindle speed range with 60 cycle motor is 3000 to 7000 r.p.m. with 50 cycle, 2375 to 4725 r.p.m. Motor capacity is ½ h.p.—2 pole.

Dimensions (overall) are 26" wide x 28" deep x 56" high.

Miller Profile Grinding Machine

A new Profile Machine is announced by Miller Engineering Co., 31 East Kinney St., Newark, N. J.

The makers stress its versatility, pointing out that it will reproduce within extremely close limits of accuracy, from any master locked in machine, such shapes as ovals, flats, bulls, tapers, grooves, internal forming, etc. After master is set in machine, work pieces are quickly removed and replaced.

Spindles are hardened and ground. Timken bearings are used throughout. Draw-in collets are provided.

Drive equipment and motor are enclosed in pedestal housing 55" high, requiring floor space of 24"x48".

DU-LITE for Defense Parts

The standard black finish for steel before the emergency, now of greater value than ever.

DU-LITE is specified for many defense parts.

DU-LITE is used as a substitute for plating on numerous non-defense products.

Find out why so many leaders in various industries have adopted DU-LITE and demand it from their sub-contractors.

Write for complete information about the DU-LITE "290" Salts, DU-LITE "29" Cleaner and PROCTOIL.

DU-LITE CHEMICAL CORP. MIDDLETOWN CONN.

SOME OF THE MANY OUTSTANDING FEATURES OF THE PORTMAN OPTICAL PROJECTOR.

1 Fast Operation.
2 Modern Functional Design.
3 Substantial Construction.
4 Optical Accuracy.
5 Large Projection Area.
6 Positive Table Movement Readings
7 Mechanical Simplicity.

PORTMAN MACHINE TOOL CO.

MOUNT VERNON—NEW YORK

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For DURABILITY and PERFORMANCE

Nearly 4000 TYPES of CASTERS & WHEELS

GET THIS FREE BOOK

...192 pages of helpful information. Here is a book that should be in your files..

DARNELL *Corporation, Ltd.*

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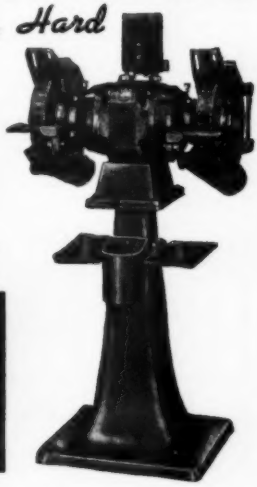
38 N. CLINTON ST., CHICAGO, ILL.
60 WALKER ST., NEW YORK N. Y.

STURDY BUILT

for Long, Hard Service

BALDOR builds a complete line of Bench and Pedestal type grinders — 6" to 12" wheels. (At left, is special Carbide Tool Grinder, 6" wheels, complete for $95.00).



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BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis, Mo.

BALDOR

BALL BEARING **GRINDERS**

MOREY
VERTICAL SHAPERS

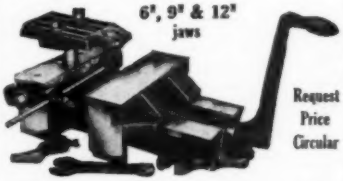
8" Stroke
12" Stroke

Timken taper roller bearings for main spindle — all others anti-friction. Accurate — simple for toolroom manufacturing. Self-contained motor drive.

Ask for Circular No. 726

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

You can set this VISE as a jig for repeat operations



Request Price Circular

GRAHAM-MULTI PURPOSE VISE

Sold with or without Jig Attachments shown, the Graham Vise is extra useful on driller, planer, miller, shaper, grinder. IMMEDIATE OR QUICK SHIPMENTS POSSIBLE.

Also shipping from stock: KNURL HOLDERS, to fit lathe turret; DRILL SPEEDERS, to increase speed 3 times.

GRAHAM MFG. CO. 54 Bridge Street, East Greenwich, R. I.

BRIDGEPORT GRINDING WHEELS

VITRIFIED
RESINOID
SILICATE
BONDS

Manufacturers . . .
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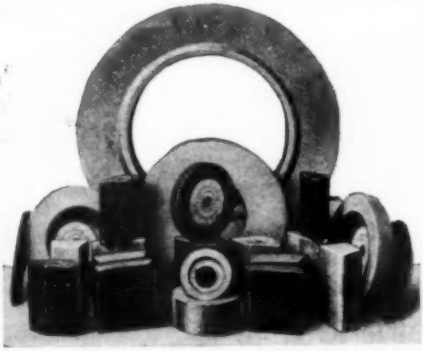

ALUMINOUS OXIDE
SILICON CARBIDE
SPECIAL ALUMINOUS OXIDE
GRAIN

In grain, grade and bond to meet your needs.

Send For Free Wheel Recommendation Booklet

BRIDGEPORT SAFETY EMERY WHEEL CO.
BRIDGEPORT, CONN.

HYBCO
TAP GRINDER

If you can't get delivery on New Taps why not get real life and service out of your old ones?

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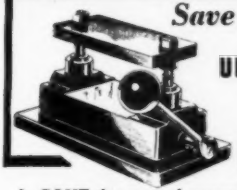
The HYBCO Tap Grinder—for sharpening Chamfer, Flutes and Spiral Points. Series 600 has a capacity from No. 2 to ⅝" Hand Taps. Series 700 No. 4 to 1" Hand Taps. Chamfer controlled by adjusting screw in head. Special Heads for Left Hand Taps can be supplied. Reasonable Deliveries.

Write for Descriptive Bulletin No. H. B.

HENRY P. BOGGIS & CO.

210 ST. CLAIR AVE. - CLEVELAND, O.

Save 3 Ways
WITH THE
UNIVERSAL VISE



Only $29.75

1. SAVE the cost of expensive drill fixtures. You only need a simple bushing plate and adaptor for each job.

2. SAVE in tooling time. Build your fixture around a completely pre-designed drill jig body.

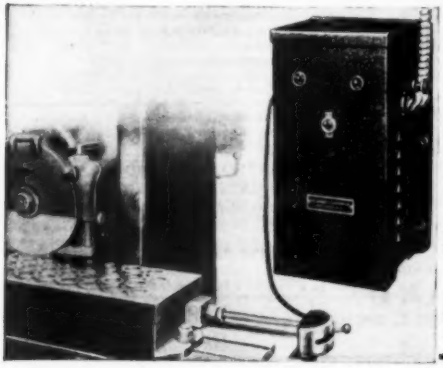
3. SAVE in production costs. Savings up to 60% in drilling time are not uncommon. Lever locks work instantly—holds securely. Throw it back and work is released. No complicated adjustments.

Let us send a vise for
10 DAYS FREE EXAMINATION
or write for illustrated folder

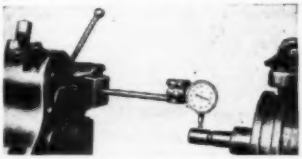
MOHR LINO-SAW CO.
130 N. Union Ave. Chicago, Ill.

D. C. Rectifiers

Mellaphone Rectifiers provide dependable, economical d. c. current at the job—energizing magnetic chucks, operating d. c. motors, etc. No moving parts to wear and require attention. Sizes and types for every job. Let us send Bulletin—"D. C. Rectifiers in Industry".



MAGNETIC
Indicator Base



The Mellaphone Magnetic Indicator Base is a powerful magnet. It holds tightly to any iron or steel surface providing quick indicator settings. Can be used in any position. Small base area for restricted places. Can be quickly moved or placed on any machine. Guaranteed full strength for 5 years.

Send for descriptive literature

MELLAPHONE CORP.
ROCHESTER, NEW YORK

Plants Available Now For Sub-Contract Work

SUPPLEMENTING the lists recently published in this original and exclusive BLUE BOOK service, here are some additional plants available for sub-contract work.

Address all communications to Defense Sub-Contract Dept., Hitchcock Publishing Co., 508 South Dearborn St., Chicago, Ill. (Phone—HARrison 6040). There are no charges or obligations. This is a gratuitious service contributed by The BLUE BOOK to help speed our American All-Out Victory Program:

H-11—Ohio plant has some open capacity and is available for sub-contracting. Equipment includes:—Bullard vertical and Lucas horizontal Boring Mills; 6 Drill Presses; 9 Grinders including precision tool grinders and Reid surface grinder 6¾"x17¾"; 9 Milling Machines; 11 Engine Lathes; 7 Turret Lathes; 30x30"x8' Gray Planer; No. 19 Bliss Punch Press, Greenerd Arbor Press No. 3—¾" and Straightening Press; 3 Shapers; Racine 6"x6" Power Saw; Delta No. 14 Band Saw; Marquette 300B Welder; Etching and Demagnetizing Equipment; Balancing Scales, etc.

H-12 — A Pennsylvania engineering and manufacturing company has excess capacity in the machine screw department and would like to obtain work for three single spindle Cleveland Automatic Screw Machines, ranging in capacity from ¾" up to 2" diameter stock. Also have one Jones & Lamson two spindle Flat Turret Lathe which will swing diameters up to 8" and turn out two work pieces simultaneously.

FIRM: F-M—A gear job shop with excellent reputation for accurate work. Does work for nationally known manufacturers. Equipment includes 2 Fellows gear shapers, 2 Gleasons, 3 G & E Hobbers, 1 Barber-Coleman hobber, 1 Newark, 2 B & S rotary cutters, 1 thread miller and a very complete line of lathes and grinding equipment. Open shop. 38 men on two shifts. Can always take on more work.

FIRM: F-O—A job machine shop highly successful in jigs and fixture work. Open shop. Have complete group of lathes, hand screw machines, millers, presses, shapers, boring mill and keyseater, etc. Also welding work. Do plenty of signal equipment work for railroads, etc. Open for more subcontract work.

FIRM: F-P—A jobbing tool and die shop. Can make commercial tolerance gages. New, modern building and equipment. Now on only one shift. Have shapers, lathes, millers, slotters, surface grinders, jig borer, presses, full complement of gages, micrometers going with such a die and tool shop. Worthy of serious consideration by any manufacturer who seeks good, careful work.

FIRM: F-R—A job shop long known for its excellent workmanship in internal and external grinding. One of best in midwest. Open shop. Have been long associated with automobile and railroad fields. Have splendid assortment of close-tolerance machines such as turret lathes, boring machines and boring bars, honing equipment, drill and hydraulic presses as well as a full line of grinders which include crank, cylindrical, internal, external and surface machines.

FIRM: F-S—A manufacturer known nationally in the pump field. Not a job shop but have available equipment for subcontract work. Good workmanship. Open shop. Have a rather complete line of machines for radial drilling, lathe and boring mills, horizontal and vertical milling machines, etc. A large precision manufacturer who gave this plant some work recently stated that the results were the best obtained anywhere in subcontract "farming out" work.

FIRM: F-T—This manufacturer is a leader in oil refinery and oil well machinery. Has a splendid plant available for sizeable subcontract work. Materials must be furnished by primary contractor. Nationally known and unusually substantial. They have an imposing list of suitable equipment for defense work including 14 Gisholt turret lathes, 20 engine lathes, 7 milling machines, 4 radial drills, 9 grinders of various capacities, 4 shapers, 25 drill presses, 9 punch presses, 5 Hole-Hog gang drills and a host of shears, tapping machines, welding equipment, etc. This firm deserves thorough study!

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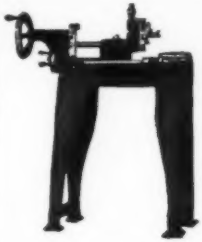

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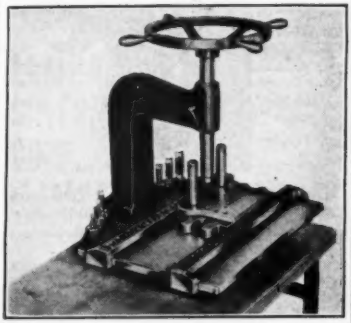

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Speeds from 250-4000

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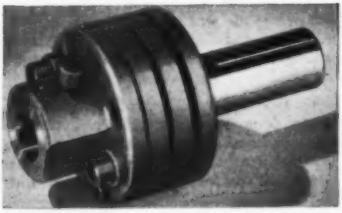
The EHRICH —— ALIGNING HOLDER



The Ehrich Aligning Holder is universally adjustable with angular adjustment in all planes and with concentricity adjustment independent of the angular adjustment. Used as a tool holder on turret lathes and screw machines, it aligns positively and accurately with the spindle reamers, taps, drills, piloted boring bars, etc. Its many applications as a work and tool holder include holding arbors on lathes, grinders, gear hobbers, etc.; holding reamers or other tools for grinding without centers, or any application requiring precision of adjustment.

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FIRM: F-V—An old established firm with national acceptance in the freight and passenger elevator field. Shop has a 100-man capacity. Working only one shift now. Equipment available includes various lathes, radial drills, horizontal milling machine, planer, etc. Medium to heavy caliber of work. Occupies three floors of a four-story building.

FIRM: F-W—This is one of the best and most modern medium-sized manufacturing plants in the middlewest. Brand new model building. They are known nationally in the portable electric tool field. Open shop. High grade staff and engineering department. Accustomed to close precision work. Equipment mostly new. Have 11 B-C hobbing machines, 3 Excello boring machines, 6 engine lathes, 6 production turret lathes, 1 screw machine, 5 millers, 1 thread miller, 9 grinders, 1 surface grinder, 1 hob grinder, 29 drill presses and a large group of miscellaneous machines such as center lappers, broach, punchpress, sanders, shaper, rivet spinner, polishing units, air presses, etc. Unquestionally an A1 plant for medium and light accurate machine work and assembly.

Wetzler Quick Action Clamps

A line of sturdy quick action Clamps of special utility in machine shops, welderies, tool rooms, etc., is offered by Wetzler Clamp Co., 2518 41 Ave., Long Island City, N. Y.

The makers point out that the clamps are constructed with "bridge" type malleable iron jaws, making them practically indestructible. The hot rolled alloy spring steel bar gives with excessive stress, but returns to original shape. The lower jaw slides along the steel bar, gripping instantly when pressure is applied. Clamping screw is of cold rolled stock with a heavy deep-cut square thread. A broad range of sizes is available.

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MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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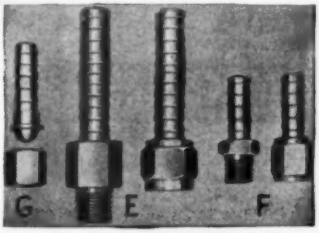

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A new hydraulic Hack Saw is offered by L. B. Mfg. Co., Box 155, Vernon, Los Angeles, Cal. It incorporates these modern features:

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11. No springs are used to accomplish lift or feeds.
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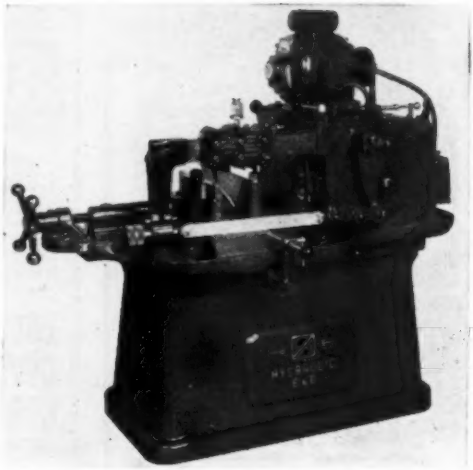

Data on Shell Cleaning

In view of the need for greatly accelerated output of munitions, an illustrated article in the November-December issue of Oakite News Service, is of timely interest since it describes new cleaning materials and methods that help speed-up shell production.

It gives considerable data on cleaning high explosive, anti-aircraft and howitzer shells ranging from 75-mm. to 155-mm. before inspection and painting, either by mechanical washing machine or tank cleaning methods.

Among the important factors discussed which influence production quality and output of shells, are the effect of drawing lubricants and cutting fluids on subsequent operations, the simplification of cleaning through new production techniques, andthe prevention of rust formation on steel shells after cleaning.

Superintendents and foremen of plating departments and contract finishing shops will also be interested in another article on the plating of aluminum, brass and Invar metal radio condenser parts to micrometer tolerances.

Copies of this issue are available from Oakite Products, Inc., 57 Thames St., New York, N. Y.

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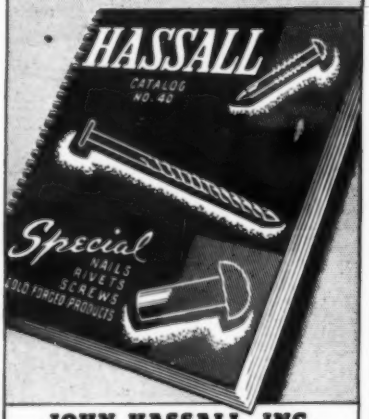

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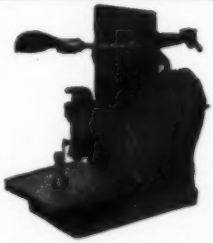

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Schultz & Anderson Co., Newark, N. J.

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Burgess Battery Co., 500 W. Huron St., Chicago

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J. C. Glenzer Co., Detroit, Mich.

AIR LINE PARTS
Air-Way Pump and Equipment Co., 569 W. Van Buren St., Chicago
M-B Products, Detroit, Mich.
Norgren Co., Denver, Colo.

ALLOYS, hard facing
Carboloy Co., Inc., Detroit, Mich.
Fansteel Metallurgical Corp., N. Chicago, Ill.
Haynes-Stellite Co, Kokomo, Ind.
McKenna Metals Co., Latrobe, Pa.
Wall-Colmonoy Corp., Detroit, Mich.

ANGLE PLATES
See Plates, angle

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Scully-Jones & Co., 1901 S. Rockwell, Chicago

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Gisholt Machine Co., Madison, Wis.
Ideal Commutator Dresser Co., Sycamore, Ill.
Norton Co., Worcester, Mass.
Sundstrand Machine Tool Co., Rockford, Ill.

BALING PRESSES
See Presses, baling

BAND SAW BLADES
See Blades, band saw

BAND SAW GUIDES
See Saw Guides, Band

BAND SAW MACHINES
See Saws, Band

BAR CUTTERS
Buffalo Forge Co., Buffalo, N. Y.

BARS, boring
Armstrong Bros. Mfg. Co., Chicago
Bridgeport Machines, Inc., Bridgeport, Conn.
Davis Boring Tool Div., St. Louis, Mo.
Russell Boring Bar Co., Middletown, Ohio
Scully-Jones & Co., 1905 S. Rockwell, Chicago
Van Norman Machine Tool Co., Springfield, Mass.

BEARINGS, ball
Abbott Ball Co., Hartford, Conn.
Ahlberg Bearing Co., 3025 W. 47th St., Chicago
Bantam Ball Bearing Co., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hartford Steel Ball Co., Hartford, Conn.
McGill Mfg. Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
New Departure Div., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Strom Steel Ball Co., 1842 S. 54th St., Cicero, Ill.
Torrington Co., Torrington, Conn.

BEARINGS, miniature
Landis & Gyr, Inc., New York, N. Y.

BEARINGS, oilless
Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.
Rhoades Metaline Co., R. W., Long Island C., N.Y.

BEARINGS, roller
Ahlberg Bearing Co., 3025 W. 47th St., Chicago
Ball & Roller Bearing Co., Danbury, Conn.
Shafer Bearings Corp., 35 E. Wacker Drive, Chgo.
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, sleeve
Bunting Brass & Bronze Co., Toledo, Ohio
Federal-Mogul Corp., Detroit, Mich.
Johnson Bronze Co., New Castle, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

BEARINGS, thrust
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BELT GRINDERS
See Grinders, Belt

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BELT SANDERS
See Sanders, Belt

BELTS, sanding
Abrasive Products, Inc., South Braintree, Mass.
Walls Sales Corp., New York, N. Y.

BELTING
Chicago Belting Co., Chicago
Graton & Knight, Worcester, Mass.
Houghton, E. F., Phila., Pa.
Rhoades & Sons, J. E., Philadelphia, Pa.

BENCH PLATES
See Plates, Bench

BENCHES, factory
Challenge Machinery Co., Grand Haven, Mich.
Stackbin Corp., Providence, R. I.
Standard Pressed Steel Co., Jenkintown, Penna.

BENDING MACHINES, angle iron
Consolidated Machine Tool Corp., Rochester, N. Y.
Excelsior Tool & Mch. Co., East St. Louis, Ill.

BENDING MACHINES, hand
Buffalo Forge Co., Buffalo, N. Y.
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Excelsior Tool and Mach. Co., E. St. Louis, Ill
Hosefeld Mfg. Co., Winona, Minn.
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BENDING MACHINES, pipe
Buffalo Forge Co., Buffalo, N. Y.

BENDING MACHINES, power
Buffalo Forge Co., Buffalo, N. Y.
Cleveland Crane and Engr. Co., Wickliffe, Ohio
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BENDING ROLLS
Buffalo Forge Co., Buffalo, N. Y.
Marshalltown Mfg. Co., Marshalltown, Iowa
Rock River Mch. Co., Div. of Hannifin Mfg. Co., Chicago

BLADES, band saw
Capewell Mfg. Co., Hartford, Conn.
Do-All Co., Des Plaines, Ill.
Red Star Products Co., Cleveland, Ohio
Simonds Saw & Steel Co., Fitchburg, Mass.
Spartan Saw Works, Springfield, Mass.
Henry G. Thompson & Son Co., New Haven, Conn.
Wallis Sales Corp., New York, N. Y.
Wells Mfg. Co., Three Rivers, Mich.

BLADES, centerless grinder
Metal Carbides Company, Youngstown, Ohio

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American Saw and Mfg. Co., Springfield, Mass.
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E. C. Atkins Co., Indianapolis, Ind.
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Capewell Mfg. Co., Hartford, Conn.
The Forsberg Mfg. Co., Birdgeport, Conn.
John H. Graham and Co., 105 Duane, N. Y. C.
Millers Falls Co., Greenfield, Mass.
Napier Saw Works, Middletown, N. Y.
Racine Tool & Mach. Co., Racine, Wis.
Simonds Saw & Steel Co., Fitchburg, Mass.
Spartan Saw Works, Springfield, Mass.
Starrett Co., L. S., Athol, Mass.
Thompson & Son Co., H. G., New Haven, Conn.
Victor Saw Works, Middletown, N. Y.

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See Torches, Heating

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Ozalid Products Div., Johnson City, N. Y.
Pease Co., C. F., Chicago, Ill.

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Acme Machinery Co., Cleveland, Ohio
Landis Machine Co., Waynesboro, Pa.
Pollow Machine Co., Detroit, Mich.
Porter Co., H. K., Everett, Mass.

BOLTS, machine
Boyar-Schultz Co., 2110 Walnut St., Chicago

BORING HEADS
Acme Tool Co., 125 Church St., N. Y. C.
C. C. Cradley Co., Shillington, Penna.
Criterion Machine Works, Beverly Hills, Calif.
Flynn Mfg. Co., Detroit, Mich.
Fray Mach. Tool Co., Glendale, Cal.
McCroskey Tool Co., Meadville, Pa.
Pacific Tool & Supply Co., 344 N. Vermont, Los Angeles, Cal.
Precision Tool Co., Box 155, Brooklyn, N. Y.
Rickert-Shafer Co., Erie, Pa.

BORING TOOLS
Armstrong Bros. Tool Co., 308 N. Francisco, Chgo.
Bokum Tool Co., Detroit, Mich.
Comet Tools, 738 Broadway, N. Y. C.
Davis Boring Tool Div., St. Louis, Mo.
Flynn Mfg. Co., Detroit, Mich.
Maxwell Co., F. A., Bedford, Ohio
Oliver Motorcraft Co., 2532 S. Wabash, Chicago
Precision Tool Co., Box 155, Brooklyn, N. Y.
Russell Boring Bar Co., Middletown, Ohio
Van Norman Machine Tool Co., Springfield, Mass.

BORING AND DRILLING MACHINES
Baker Brothers, Toledo, Ohio
Bradford Machine Tool Co., Cincinnati, O.
Ex-Cell-O Corp., Detroit, Mich.
Giddings & Lewis Mch. Tl. Co., Fond du Lac, Wis.
Sellers & Co., Wm., Philadelphia, Pa.
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BOXES, stacking
See Racks and Bins, Storage

BRAKES, hand, power
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East Shore Machine Products Co., Cleveland, O.
LaPointe Machine Tool Co., Hudson, Mass.
National Broach & Mch. Co., Detroit, Mich.

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Colonial Broach Co., Detroit, Mich.
Detroit Broach Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.
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Hisey Wolf Machine Co., Cincinnati, Ohio
Jefferson Machine Tool Co., Cincinnati, Ohio
Mail Tool Co., 7742 So. Chicago Ave., Chicago
Packer Machine Co., Meriden, Conn.
Production Machine Co., Greenfield, Mass.
Standard Electric Tool Co., Cincinnati, Ohio
Vonnegut Moulder Corp., Indianapolis, Ind.

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Rock River Mch. Co., Div. of Hannifin Mfg. Co., Chicago

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See Bearings, Sleeve

BUSHINGS, jig
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Colonial Broach Co., Detroit, Mich.
Economy Tool and Mach. Co., Milwaukee, Wis.
Ex-Cell-O Corp., Detroit, Mich.
Universal Engineering Co., Frankenmuth, Mich.

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Park Sales Co., 3 Park Place, N. Y. C.

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Mechanite Research Inst. of Am., Pittsburgh

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Pratt & Whitney, West Hartford, Conn.
Seneca Falls Machine Co., Seneca Falls, N. Y.
Stokerunit Corp., Milwaukee, Wis.
Sundstrand Machine Tool Co., Rockford, Ill.

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Carboloy Company, Detroit, Mich.
McKenna Metals Co., Latrobe, Pa.
Modern Machine Corp., Brooklyn, N. Y.

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Cerro de Pasco Copper Corp., 40 Wall St., N.Y.C.

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Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

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Consolidated Mach. Tool Corp., Rochester, N. Y.
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Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Penna.
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Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, O.
Rickert-Shafer Co., Erie, Pa.

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Kearney and Trecker Corp., Milwaukee, Wis.

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Stanley Tools, New Britain, Conn.

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J. W. Bullard Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Jones and Lamson Machine Co., Springfield, Vt.
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Sundstrand Mach. Tool Co., Rockford, Ill.

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Hannifan Mfg. Co., 621 S. Kolmar Ave., Chicago
Logansport Engineering Co., Logansport, Ind.

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T. R. Almond Co., Ashburnham, Mass.
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Erickson Steel Co., Cleveland, Ohio
Errington Mechanical Laborat'y, Staten Island, N.Y.
Ettco Tool Co., Brooklyn, N. Y.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Works, Rochester, N. Y.
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DeWalt Products Corp., Lancaster, Pa.
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Luma Elec. Equipment Co., Toledo, Ohio
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Walker, O. S., Worcester, Mass.

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Dia-Tool, Inc., Yonkers, N. Y.
F. F. Gilmore Co., Boston, Mass.
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Haake, Chas. F., 19-21 Cliff, New York City
Industrial Diamond Co., Detroit, Mich.
Karelsen, Inc., E., 56 W. 45th St., N. Y. C.
Koebel Diamond Tool Co., Detroit, Mich.
Anton Smit & Co., 24 State St., N. Y. C.
Smit & Sons, J. K., 157 Chambers St., N. Y. C.

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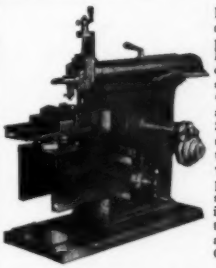

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L-W Chuck Co., Toledo, Ohio
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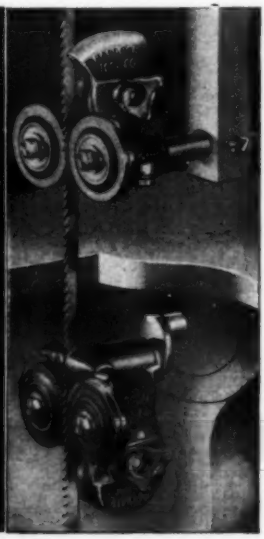

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Kent Machine Co., Cuyahoga Falls, Ohio
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Walker-Turner Co., Plainfield, N. J.

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Leland-Gifford Co., Worcester, Mass.
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Cincinnati Electrical Tool Co., Cincinnati, Ohio
Dumore Co., Racine, Wis.
Duro Metal Products Co., 2649 N. Kildare, Chicago
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Independent Pneu. Tool Co., Chicago, Ill.
Mall Tool Co., Chicago, Ill.
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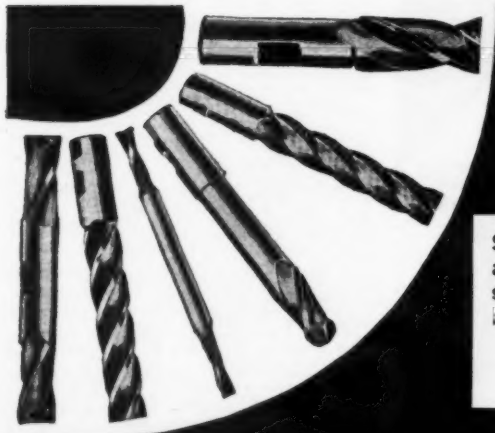
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Cincinnati Bickford Tool Co., Oakley, Cincinnati
Foote-Burt Co., Cleveland, O.



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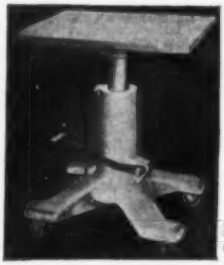

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Torq Electric Mfg. Co., Cleveland, Ohio
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See Die Filers

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Sterling Tool Products Co., 357 E. Ohio, Chicago

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Federal Products Co., Providence, R. I.
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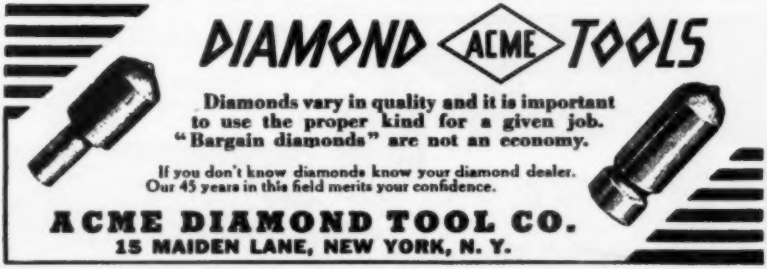
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United Precision Products Co., 4613 W. Huron, Chicago

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Follows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit, Mich.

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Crago Gear and Mach. Works, Kansas City, Mo.
General Electric Co., Pittsfield, Mass.
Gleason Works, Rochester, N. Y.
Greaves Machine Tool Co., Cincinnati, O.
Hartford Special Machy. Co., Hartford, Conn.
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D. O. James Co., Chicago
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Philadelphia Gear Works, Philadelphia, Pa.
Shaw Box Crane & Hoist Div., Muskegon, Mich.
Stahl Gear & Machine Co., Cleveland, Ohio
Taylor Machine Co., Cleveland, Ohio

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Brown Gear Co., Brooklyn, N. Y.
Ganschow Gear Co., Chicago, Ill.
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GEARS, master
Michigan Tool Co., Detroit, Mich.

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Gaston Power Tools, Evergreen Park, Ill.
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Star Mch. & Engineering Co., Bloomfield, N. J.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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American Optical Co., Southbridge, Mass.
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Porter-Cable Machine Co., Syracuse, N. Y.
Production Machine Co., Greenfield, Mass.

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Armglo Co., Milwaukee, Wis.
Atlas Press Co., Kalamazoo, Mich.
Baldor Electric Co., St. Louis, Mo.

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Cutter Machine Co., St. Louis, Mo.
Delta Mfg. Co., Milwaukee, Wis.
Gronby Mfg. Co., Plainville, Conn.
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Hisey-Wolf Machine Co., Cincinnati, Ohio
Hobart Brothers, Troy, Ohio
LaSalle Tool Co., Ottawa, Ill.
Skilsaw, Inc., 5035 Elston, Chicago
Standard Electric Tool Co., Cincinnati, Ohio
Stanley Works, New Britain, Conn.
T. C. M. Mfg. Co., Harrison, N. J.
U. S. Electric Tool Co., Cincinnati, Ohio
Vonnegut Moulder Co., Indianapolis, Ind.
Walker-Turner Co., Plainfield, N. J.
Walls Sales Corp., New York, N. Y.

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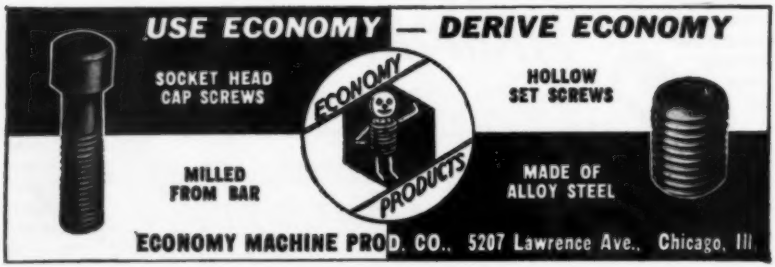
Baldor Electric Co., St. Louis, Mo.
Carboloy Company, Detroit, Mich.
Criterion Machine Works, Beverly Hills, Calif.
Ex-Cell-O Corp., Detroit, Mich.
Hammond Machinery Builders, Kalamazoo, Mich.
K. O. Lee and Son, Aberdeen, S. D.
Sellers & Co., Wm., Philadelphia, Pa.
Standard Elec. Tool Co., Cincinnati, O.
Thomas Prosser & Son, 120 Wall St. N. Y. C.
T. C. M. Mfg. Co., Harrison, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

GRINDERS, centerless
Cincinnati Grinders, Inc., Cincinnati, Ohio
Heald Machine Co., Worcester, Mass.
Norton Co., Worcester, Mass.

GRINDERS, cutter and tool
See Grinders, Tool and Cutter

GRINDERS, disc
Chas. H. Besly and Co., Chicago
Cincinnati Elec. Tool Co., Cincinnati, Ohio
Cincinnati Machy. and Supply Co., Cincinnati, O.
Clizbe Brothers, Plymouth, Ind.
Delta Mfg. Co., Milwaukee, Wis.
Fitchburg Grinding Mach. Corp., Fitchburg, Mass.
Gardner Machine Co., Beloit, Wis.
Hammond Machinery Builders, Kalamazoo, Mich.
Hisey-Wolf Machine Co., Cincinnati, Ohio
Production Machine Co., Greenfield, Mass.
Ransom Grinding Machine Co., Oshkosh, Wis.
Standard Electrical Tool Co., Cincinnati, Ohio
U. S. Electrical Tool Co., Cincinnati, Ohio
Vonnegut Moulder Corp., Indianapolis, Ind.

GRINDERS, drill
Atlas Press Co., Kalamazoo, Mich.
Black Diamond Saw Machine Co., Natick, Mass.
Blake Co., Edward, Newton Centre, Mass.
Covel Mfg. Co., Benton Harbor, Mich.
Galimeyer & Livingston Co., Grand Rapids, Mich.
Kokomo Machine Co., Kokomo, Ind.
McDonough Mfg. Co., Eau Claire, Wis.
Mail Tool Co., 7742 S. Chicago Ave., Chicago
Oliver Instrument Co., Adrian, Mich.
Sellers & Co., Wm., Philadelphia, Pa.
Star Electric Motor Co., Bloomfield, N. J.



GRINDERS, flexible shaft
See Flexible Shaft Machinery

GRINDERS, gear
Fellows Gear Shaper Co., Springfield, Vt.
Fitchburg Grinding Machine Co., Fitchburg, Mass.
Pratt & Whitney, West Hartford, Conn.

GRINDERS, hand
See Grinders, Portable

GRINDERS, internal
See Grinders, Precision

GRINDERS, knife
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Covel-Hanchett Co., Big Rapids, Mich.
Madison Machine Works, Rockford, Ill.
Samuel C. Rogers and Son Co., Philadelphia, Pa.

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Landis Tool Co., Waynesboro, Penna.
Peters Tool Co., Milwaukee, Wis.

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Chicago Pneu. Tool Co., 6 E. 44th St., N. Y. C.
Independent Pneu. Tool Co., Chicago
Ingersoll-Rand Co., New York City
M-B Products Co., Detroit, Mich.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Chicago
Rotor Air Tool Co., Cleveland, O.

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Chicago Pneu. Tool Co., 6 E. 44th St., N. Y. C.
Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chg.
Cincinnati Elec. Tool Co., Cincinnati
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Duro Metal Prod. Co., 2649 N. Kildare Ave., Chgo.
Gaston Power Tools, Evergreen Park, Ill.
H. & H. Research Co., Detroit, Mich.
Hisey-Wolf Machine Co., Cincinnati, O.
Ind. Pneu. Tool Co., Chicago
Jarvis Co., Chas. L., Middletown, Conn.
Mall Tool Co., 7742 So. Chicago Ave., Chicago
Pratt & Whitney, West Hartford, Conn.
Skilsaw, Inc., Chicago
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Stanley Works, New Britain, Conn.
Syntron Co., Homer City, Pa.
S. S. White Dental Co., New York City

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Cincinnati Grinders, Inc., Cincinnati, Ohio
Cleveland Tool Eng. Co., Cleveland, O.
Dumore Co., Racine, Wis.
Grenby Mfg. Co., Plainville, Conn.
Landis Tool Co., Waynesboro, Pa.
McGaregal Mfg. Co., East Rutherford, N. J.
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Norton Co., Worcester, Mass.
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Sunnen Products Co., St. Louis, Mo.
Thompson Grinder Co., Springfield, Ohio
U. S. Electrical Tool Co., Cincinnati, Ohio
Universal Hi-Speed Tool Co., 549 W. Washington, Chicago

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Stanley Works, New Britain, Conn.

GRINDERS, snagging
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Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Gardner Machine Co., Beloit, Wis.
Hammond Machinery Builders, Kalamazoo, Mich.
Jarvis Co., Chas. L., Middletown, Conn.
Jefferson Machine Tool Co., Cincinnati, Ohio
Standard Electrical Tool Co., Cincinnati, Ohio
U. S. Electrical Tool Co., Cincinnati, Ohio
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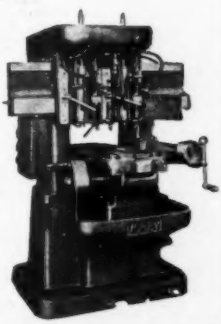

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Continental Machines Inc., Minneapolis, Minn.
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Gallmeyer and Livingston Co., Grand Rapids, Mich.
Gardner Machine Co., Beloit, Wis.
Granell & Son, Toronto, Canada
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Hanchett Mfg. Co., Big Rapids, Mich.
Heald Co., Worcester, Mass.
Hill Acme Co., Cleveland, Ohio
Leach Machinery Co., H., Providence, R. I.
Mattison Machine Works, Rockford, Ill.
Pratt & Whitney, West Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Jefferson Machine Tool Co., Cincinnati, Ohio
Vonnegut Moulder Corp., Indianapolis, Ind.

GRINDERS, tap
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Henry P. Boggis Co., Cleveland, Ohio
Cleveland Tool Eng. Co., Cleveland, O.
Ex-Cell-O Corp., Detroit, Mich.
Gallmeyer & Livingston, Grand Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.

GRINDERS, thread
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Bryant Chucking Grinder Co., Springfield, Vt.
Daizen Tool and Mfg. Co., Detroit, Mich.
Dumore Co., Racine, Wis.
Jones & Lamson Machine Co., Springfield, Vt.

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Brown-Brockmeyer Co., Dayton, Ohio
Cincinnati Grinders, Inc., Cincinnati, Ohio
Cleveland Tool Eng. Co., Cleveland, O.
Covel Mfg. Co., Benton Harbor, Mich.
Gallmeyer and Livingston Co., Grand Rapids, Mich.
General Machinery Corp., Boston, Mass.
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Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago
Hisey-Wolf Machine Co., Cincinnati, Ohio
Landis Tool Co., Waynesboro, Penna.
LeBlond Machine Tool Co., R. K., Cincinnati, O.
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McDonough Mfg. Co., Eau Claire, Wis.
Oliver Inst. Co., Adrian, Mich.
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Sundstrand Machine Tool Co., Rockford, Ill.
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U. S. Electrical Tool Co., Cincinnati, O.

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Dumore Co., Racine, Wis.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gaston Power Tools, Evergreen Park, Ill.
Hisey-Wolf Machine Co., Cincinnati, Ohio
Liberty Tool & Gage Wks., Providence, R. I.
Madison-Kipp Corp., Madison Wis.
N. A. Strand Co., Chicago

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Brown and Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio
Crystal Lake Machine Works, Crystal Lake, Ill.
Fitchburg Grinding Machine Co., Fitchburg, Mass.
Gallmeyer and Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Penna.
R. K. LeBlond Machine Tool Co., Cincinnati, Ohio
Norton Co., Worcester, Mass.
Rivett Lathe and Grinder, Inc., Boston, Mass.
Thompson Grinder Co., Springfield, Ohio

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Eastern Centerless Grinding Co., Hartford, Conn.
The Helm Co., Fairfield, Conn.
The Saroston Co., Upper Montclair, N. J.
Taylor Machine Co., Cleveland, Ohio

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Majestic Tool & Mfg. Co., Detroit, Mich.
Nielsen, Inc., Lawton, Mich.
Pope Machinery Co., Haverhill, Mass.

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Bay State Abrasive Prod. Co., Westboro, Mass
Blanchard Machine Tool Co., Cambridge, Mass.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Carborundum Co., Niagara Falls, N. Y.
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Dirats Mfg. Co., Westfield, Mass.
Gardner Machine Co., Beloit, Wis.
Macklin Company, Jackson, Mich.
Norton Co., Worcester, Mass.
Smit & Sons, Inc., J. K., 157 Chambers, N. Y. C.
Vitrified Wheel Co., Westfield, Mass.
Waltham Grinding Wheels Co., Waltham, Mass.

GUARDS, gear
Littleford Brothers, Cincinnati, Ohio

HACK SAW BLADES
See Blades, Hack Saw

HACK SAW MACHINES
See Saws, Hack

HAMMERS, portable, electric
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Wodack Electric Tool Corp., Chicago

HAMMERS, soft
Chicago Rawhide Mfg. Co., Chicago
Greene-Tweed and Co., New York City
Stanley Works, New Britain, Conn.

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S. and S. Machine Works, 4539 W. Lake, Chicago

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Union Twist Drill Co., Athol, Mass.

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Chicago Pneu. Tool Co., E. 44th St., N. Y. C.
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Detroit Hoist and Machine Co., Detroit, Mich.
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Reading Chain and Block Corp., Reading, Pa.
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Severance Tool Mfg. Co., Saginaw, Mich.
Wyzenbeek & Staff, 838 W. Hubbard, Chicago

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Micromatic Hone Corp., Detroit, Mich.
Norton Co., Worcester, Mass.
Sunnen Products Co., St. Louis, Mo.

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Chicago Metal Hose Corp., Maywood, Ill.
Titeflex Metal Hose Co., Newark, N. J.
Weatherhead Co., Cleveland, O.

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Ex-Cell-O Corp., Detroit, Mich.
Hannifin Mfg. Co., 621 S. Kolmar St., Chicago
Root Co., B. M., York, Pa.
Sundstrand Mach. Tool Co., Rockford, Ill.

INDEX FIXTURES

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Hart Machine Co., Dorchester, Boston, Mass.
Hartford Special Machinery Co., Hartford, Conn.
L-W Chuck Co., Toledo, O.

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Koch Test Indicators, Nyack, N. Y.
Reich Mfg. Co., J. R., Dayton, Ohio
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Standard Gage Co., Poughkeepsie, N. Y.
Starrett, L. S., Athol, Mass.

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See Grinders, Knife

KNURLING TOOLS

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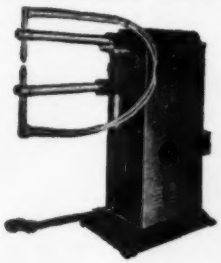

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Bradford Machine Tool Co., Cincinnati, Ohio
Hendey Mach. Tool Co., Torrington, Cnn.
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Lehmann Machine Co., St. Louis, Mo.
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Springfield Machine Tool Co., Springfield, Ohio
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Lipe, Inc., W. C., Syracuse, N. Y.
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Schauer Machine Co., Cincinnati, Ohio
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South Bend Lathe Works, South Bend, Ind.

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Jones & Lamson Machine Co., Springfield, Vt.
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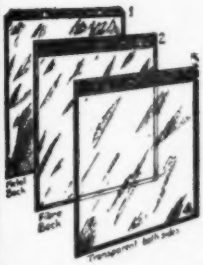

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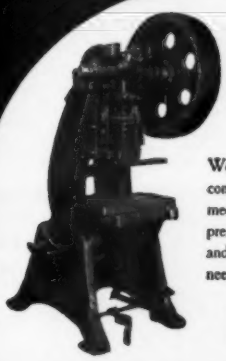

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South Bend Tool & Die Co., South Bend, Ind.
U. S. Tool Co., Ampere, N. J.

PLATING, chromium
Master Chrome Service, Inc., Cleveland, Ohio
Michigan Chrome Service Co., Detroit, Mich.

PNEUMATIC TOOLS, rebuilding
Eastern Cutter Salvage Corp., Newark, N. J.
Master Tool Co., Cleveland, Ohio

POLISHING MACHINES
See Buffing and Polishing Machines

PRESS BRAKES
Cyril Bath and Co., Cleveland, Ohio
Beatty Mchy. & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch and Shear Works, Cleveland, O.
Dreis and Krump Mfg. Co., 7440 Loomis, Chicago
Verson Allsteel Press Co., 9303 S. Kenwood, Chgo.
Whitney Metal Tool Co., Rockford, Ill.

PRESS FEEDS
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Dickerman Mfg. Co., Springfield, Mass.
Federal Press Co., Elkhart, Ind.
Littell Machine Co., F. J., 4153 Ravenswood, Chgo.

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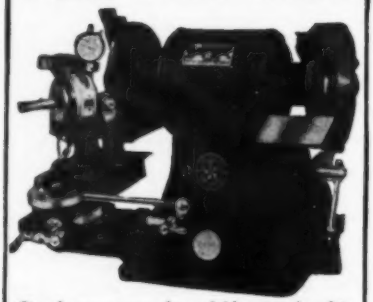

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U. S. Tool Co., Ampere, N. J.
Wittek Mfg. Co., Chicago

PRESS GUARDS
Grand Haven Stamp Products Co., Grand Haven, Mich.
Quality Tool & Hdwe. Co., 5831 N. Ravenswood Chicago
Taylor Shantz Co., Rochester, N. Y.

PRESSES, arbor
Atlas Press Co., Kalamazoo, Mich.
Canedy-Otto Mfg. Co., Chgo. Hghts, Ill.
Elmes Engineering Co., Chicago
Famco Machine Co., Racine, Wis.
Faribault Mach. Shop & Fdry., Faribault, Minn.
Greenerd Arbor Press Co., Nashua, N. H.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago
Lempco Products, Inc., Bedford, Ohio
W. H. Nicholson and Co., Wilkesbarre, Pa.
Sheldon Machine Co., 4242 N. Knox, Chicago
Wilson, K. R., Buffalo, N. Y.

PRESSES, baling
Galland-Henning Mfg. Co., Milwaukee, Wis.

PRESSES, bench
Atlas Press Co., Kalamazoo, Mich.
Greenerd Arbor Press Co., Nashua, N. H.
Leslie Welding Co., 2947 Carroll Ave., Chgo., Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Milliken Machine Co., West Newton, Mass.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Ross Co., David J., Benton Harbor, Mich.
W. A. Whitney Mfg. Co., Rockford, Ill.
Whitney Metal Tool Co., Rockford, Ill.

PRESSES, broaching
American Broach and Mach. Co., Ann Arbor, Mich.
Greenerd Arbor Press Co., Nashua, N. H.

PRESSES, foot
Famco Machine Co., Racine, Wis.
Niagara Mach. and Tool Works, Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Peck, Stow and Wilcox Co., Southington, Conn.
Taylor and Fenn, Hartford, Conn.

PRESSES, forming
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Dreis & Krump Mfg. Co., 7440 Loomis Blvd, Chg.
Elmes Engineering Co., Chicago
Federal Press Co., Elkhart, Ind.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago
L. & J. Press Co., Elkhart, Ind.
U. S. Tool Co., Ampere, N. J.

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American Broach & Mach. Co., Ann Arbor, Mich.
American Chain & Cable Co., Wright Div., York, Penna.
Atlas Press Co., Kalamazoo, Mich.
Beatty Mfg. & Mch. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Machine Corp., Chicago
Dennison Engineering Co., Columbus, Ohio
Diamond Machine Co. of Philadelphia, Phila., Pa.
Elmes Engineering Co., Chicago
Erie Foundry Co., Erie, Pa.
Farquhar Co., A. B., York, Penna.
Greenerd Arbor Press Co., Nashua, N. H.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lake Erie Eng. Co., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Pacific Hyd. Press & Tool Co., Huntington Pk., Cal.
Remco Products Corp., York, Penna.
Walsh Press & Die, 4769 W. Kinzie, Chicago
R. D. Wood Co., Philadelphia, Pa.

PRESSES, percussion
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, power (punch)
Beatty Machine and Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati, O.
Clearing Machine Corp., Chicago
Federal Press Co., Elkhart, Ind.
Henry and Wright Mfg. Co., Hartford, Conn.
L. and J. Press Corp., Elkhart, Ind.
J. L. Lucas & Son, Inc., Bridgeport, Conn.
Marshalltown Mfg. Co., Marshalltown, Ia.
Milliken Machine Co., West Newton, Mass.

PRESSES, power (punch) (Cont'd.)
Niagara Machine & Tool Works, Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Rockford Iron Works, Rockford, Ill.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
V. and O. Press, Hudson, N. Y.
Verson Allsteel Press Co., 9303 S. Kenwood, Chgo.
Zeh and Hahnemann, Newark, N. J.

PRESSES, toggle
Beatty Mfg. & Mch. Co., Hammond, Ind.

PROFILING MACHINES
Consolidated Mach. Screw Corp., Rochester, N. Y.
Geo. Gorton Machine Co., Racine, Wis.
Miller Engineering Mche. Co., Newark, N. J.
Morey Machinery Co., 410 Broome St., N. Y. C.
Pratt & Whitney, West Hartford, Conn.
Wade Tool Co., Waltham, Mass.

PROJECTORS, optical
Bausch & Lomb, Rochester, N. Y.
Jones & Lamson Machine Co., Springfield, Vt.
Portman Machine Tool Co., Mt. Vernon, N. Y.
Scherr Co., Geo., 122 Lafayette St., N. Y. C.

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Armstrong Bray and Co., Chicago
Blum Tool Co., Los Angeles, Cal.
Coffing Hoist Co., Danville, Ill.
Owatonna Tool Co., Owatonna, Minn.
Templeton Kenley Co., Chicago, Ill.

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Nonslip Pulley Covering Co., Buffalo, N. Y.

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Chicago Die Casting Mfg. Co., 2512 W. Monroe, Chicago
Dodge Mfg. Corp., Mishawauka, Indiana
Duro Metal Prod. Co., 2649 N. Kildare Ave., Chg.
Link-Belt Company, Chicago, Ill.
Maurey Mfg. Co., 2915 So. Wabash, Chicago
Medart Co., St. Louis, Mo.
Pyott Foundry and Mach. Co., Chicago, Ill.
Vacuum Cup Metal Pulley Co., Detroit, Mich.

PULLEYS, variable speed
Columbia Varispeed Co., Wheaton, Ill.
Ideal Commutator Dresser Co., Sycamore, Ill.
Reeves Pulley Co., Columbus, Ind.
Speedmaster Co., Div. Continental Machines, Inc., Minneapolis, Minn.
Standard Transmission Equipment Co., Los Angeles, Calif.
Toledo Timer Co., Toledo, Ohio

PUMPS, barrel
Air-Way Pump & Equip. Co., 569 W. Van Buren St., Chicago, Ill.
Grandahl Tool & Mach. Co., Hartford, Conn.

PUMPS, centrifugal
Brown and Sharpe Mfg. Co., Providence, R. I.
Fairbanks-Morse Co., Chicago, Ill.
Fulflo Specialties Co., Blanchester, O.
Gould Pumps, Inc., Seneca Falls, N. Y.
Ingersoll-Rand Co., New York City
Pioneer Engrg. and Mfg. Co., Detroit, Mich.
Ruthman Machinery Co., Cincinnati, O.
Tomkins-Johnson Co., Jackson, Mich.

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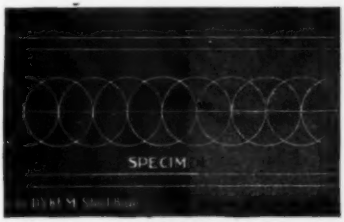
Eastern Engineering Co., New Haven, Conn.
Fulflo Specialties Co., Blanchester, Ohio
Gray-Mills Co., 215 W. Ontario, Chicago
Pioneer Eng. & Mfg. Co., Detroit, Mich.
Ruthman Machinery Co., Cinc., Ohio
Spiegel Corp., G. B., 3962 S. Calumet, Chicago
Sundstrand Machine Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Vickers Incorporated, Detroit, Mich.

PUMPS, hydraulic
Brown & Sharpe Mfg. Co., Providence, R. I
Elmes Engrg. Works, Chicago, Ill.
Fulflo Specialties Co., Blanchester, Ohio
Racine Tool & Machine Co., Racine, Wis.
Roper Corp., Geo. D., Rockford, Ill.
Ruthman Machinery Co., Cincinnati, Ohio
Sundstrand Machine Tool Co., Rockford, Ill.
Vickers, Incorporated, Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa

PUNCH PRESS FEEDS
See Press Feeds

PUNCH PRESS GUARDS
See Press Guards



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Whitney Metal Tool Co., Rockford, Ill.

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Durable Punch & Die Co., 308 N. Loomis, Chicago
Federal Press Co., Elkhart, Ind.
Wiedeman Machine Co., Philadelphia, Pa.

PUNCHES, piercing
Durable Punch & Die Co., 308 N. Loomis, Chicago

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E. A. Baumbach Mfg. Co., Chicago
Knu-Vise, Inc., Detroit, Mich.
Lowthwaite & Co., T. H., New York, N. Y.
Stanley Works, New Britain, Conn.
Whitney Mfg. Co., W. A., Rockford, Ill.
Williams and Co., J. H., New York City

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Buffalo Forge Co., Buffalo, N. Y.
Excelsior Tool and Mach. Co., E. St. Louis, Ill.
J. F. Kidder Mfg. Co., Burlington, Vt.
Ryerson & Son, Jos. T., 1600 S. Rockwell, Chicago
Wiedeman Machine Co., Philadelphia, Pa.

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Apex Machine and Tool Co., Dayton, O.
Cincinnati Tool Co., Cincinnati, Ohio
Ryerson & Son, Inc., Jos. T., 1600 Rockwell, Chgo.

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Bristol Company, Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Illinois Testing Laboratories, 150 W. Hubbard St. Chicago
Pyro-Electric Instrument Co., Detroit
Pyrometer Instrument Co., 102 Lafayette, NYC.

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Cincinnati Clamp Co., Cincinnati, Ohio
Lyon Metal Products Co., Aurora, Ill.
Pollard Bros. Mfg. Co., 5505 N. W. Hwy., Chgo.
Stackbin Corp., Providence, R. I.
Sterling Factory Equipment Co., Providence, R. I.
Western Tool & Mfg. Co., Springfield, Ohio
Yohe Supply Co., Wm. S., Canton, Ohio

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Frick-Gallagher Mfg. Co., Wellston, Ohio
Interior Steel Equip. Co., Cleveland, Ohio
Lyon Iron Works, Aurora, Ill.
Stackbin Corp., Providence, R. I.
Sterling Factory Equipment Co., Prov. R. I.
Universal Fixture Corp., New York, N. Y.
Yohe Supply Co., Wm. S., Canton, Ohio

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Alco Tool Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
McCrosky Tool Corp., Meadville, Pa.

REAMERS
Acme Industrial Co., 210 N. Laflin St., Chicago
Barber Colman Co., Rockford, Ill.
Carboloy Company, Detroit, Mich.
Chicago Pneu. Tool Co., 6 E. 44th St., N. Y. C.
Evans Flexible Reamer Co., Ravenswood & Wilson, Chicago
Gammons Holman Co., Manchester, Conn.
Glenzer Co., J. C., Detroit, Mich.
Holman Reamer Co., Manchester, Conn.
Kelly Reamer Co., Cleveland, Ohio
McCrosky Tool Corp., Meadville, Pa.
Midwest Tool & Mfg. Co., Detroit
Putnam Tool Co., Detroit, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Wetmore Reamer Co., Milwaukee, Wis.
Whitman and Barnes Co., Detroit, Mich.

REAMERS, power
Catskill Metal Works, Catskill, N. Y.
Hart Machine Co., Dorchester, Boston, Mass.
Rotor Air Tool Co., Cleveland, Ohio

RECTIFIERS, a. c.—d. c.
Continental Machines, Inc., Minneapolis, Minn.
Electromatic Products Co., Chicago
Janette Mfg. Co., Chicago
Mellaphone Corp., Rochester, N. Y.

REELS, stock
See Press Feeds

REELS, wire
Moslo Machinery, Inc., Cleveland, Ohio
Nilson Machine Co., A. H., Bridgeport, Conn.
Westlen Mfg. Co., Bridgeport, Conn.

RIDDLES, foundry
Jefferson Machine Tool Co., Cincinnati, Ohio

RIFLING MACHINES
American Broach & Mach. Co., Ann Arbor, Mich.
Builders Iron Foundry, Providence, R. I.
LeBlond Mche. Tool Co., Cincinnati, O.
Pratt & Whitney, West Hartford, Conn.

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Buffalo Forge Co., Buffalo, N. Y.
Chicago Pneu. Tool Co., 6 E. 44th St., N.Y.C.
Chicago Rivet and Mach. Co., Cicero, Ill.
Grant Mfg. and Mach. Co., Bridgeport, Conn.
Hanna Engineering Works, 1765 Elston Ave., Chgo.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago
High Speed Hammer Co., Rochester, N. Y.
Linley Brothers, Bridgeport, Conn.
National Purchasing Co., Detroit, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Tubular Rivet & Stud Co., Wollaston, Mass.

RIVETS
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John Hassall, Inc., Brooklyn, N. Y.
Lamson and Sessions Co., Cleveland, O.
Tubular Rivet and Stud Co., Boston, Mass.

ROUTING MACHINES
Ekstrom Carlson and Co., Rockford, Ill.
Geo. Gorton Mach. Co., Racine, Wis.
Knight Machinery Co., W. D., St. Louis, Mo.
Onsrud Machine Works, Chicago

RUSTPROOFING
Wayne Chemical Prod. Co., Detroit, Mich.

SALT BATHS
See Carborizing Baths

SAND BLAST EQUIPMENT
American Foundry Equipment Co., Mishawaka, Ind.
Pangborn Co., Hagerstown, Md.

SANDERS
Armelo Company, Milwaukee, Wis.
Aro Equipment Corp., Bryan, Ohio
Boice-Crane Co., Toledo, Ohio
Chicago Pneu. Tool Co., New York City
Detroit Surfacing Machine Co., Detroit, Mich.
Duro Metal Prod. Co., 2649 N. Kildare, Chicago
Haskins Co., R. G., Chicago
Ind. Pneu. Tool Co., Chicago, Ill.
Jarvis Co., Chas., L., Middletown, Conn.
Jefferson Mach. Tool Co., Cincinnati, Ohio
Mall Tool Co., 7742 South Chicago Ave., Chicago
Nedco Tool Co., Waltham, Mass.
Porter Cable Mach. Co., Syracuse, N. Y.
Production Machine Co., Greenfield, Mass
Rotor Air Tool Co., Cleveland, Ohio
Skilsaw, Inc., 503 Elston, Chicago
Stanley Works, New Britain, Conn.
Sterling Tool Prod. Co., Chicago
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Sundstrand Mach. Tool Co., Rockford, Ill.
Walker Turner Co., Plainfield, N. J.
Walls Sales Corp., New York, N. Y.
Wyzenbeek and Staff, Inc., 835 W. Hubbard, Chgo.

SANDERS, belt
Armgio Company, Milwaukee, Wis.
Boice-Crane Co., Toledo, Ohio
Jefferson Machine Tool Co., Cincinnati, Ohio
Mead Specialties Co., 15 S. Market, Chicago
Porter-Cable Machine Co., Syracuse, N. Y.
Production Machine Co., Greenfield, Mass.
Walls Sales Corp, New York, N. Y.

SAW GUIDES, band
Black Diamond Saw Machine Co., Natick, Mass.
Paddock Tool Co., Kansas City, Mo.

SAW SHARPENERS
E. C. Atkins Co., Indianapolis, Ind.
Black Diamond Saw Mach. Co., Natick, Mass.
Covel Mfg. Co. Benton Harbor, Mich.
Covel-Hanchett Co., Big Rapids, Mich.
Industrial Engineering Co., Minneapolis, Minn.
Foley Mfg. Co., Minneapolis, Minn.
Huther Brothers Saw Mfg. Co., Rochester, N. Y.
Samuel C. Rogers Co., Buffalo, N. Y.
Standard Elec. Tool Co., Cincinnati, Ohio
Wardwell Mfg. Co., Cleveland, Ohio

SAWS, band
(Also see Saws, Contour. For blades see Blades, Band Saw)
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago
Atlantic Saw Mfg. Co., New Haven, Conn.
Boice-Crane Co., Toledo, Ohio
Continental Machines, Inc., Minneapolis, Minn.
Delta Mfg. Co., Milwaukee, Wis.
Duro Metal Prod. Co., 2649 N. Kildare, Chicago
Grob Brothers, Grafton, Wis.
Johnson Machine Works, Albion, Mich.
Kalamazoo T. & S. Co., Kalamazo, Mich.
Racine Tool & Mch. Co., Racine, Wis.
Tannewitz Works, Grand Rapids, Mich.
Walker-Turner Co., Plainfield, N. J.
Wells Mfg. Co., Three Rivers, Mich.

SAWS, contour
Atlantic Saw Mfg. Co., New Haven, Conn.
Continental Machines, Inc., Minneapolis, Minn.
Kalamazoo T. & S. Co., Kalamazoo, Mich.
Thompson & Son Co., Henry G., New Haven, Conn.

SAWS, cutting-off
E. C. Atkins and Co., Indianapolis, Ind.
Porter-McLeod Mach. Tool Co., Hatfield, Mass.
Ryerson & Son, Inc., Jos. T., 1600 S. Rockwell, Chicago
Wells Mfg. Co., Three Rivers, Mich.

SAWS, hack
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Covel Mfg. Co., Benton Harbor, Mich.
L-W Chuck Co., Toledo, Ohio
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., Racine, Wis.
Rapid Manufacturing Co., Glendale, Calif.
Rasmussen Machine Co., Racine, Wis.
Wells Mfg. Corp., Three Rivers, Mich.

SAWS, hole
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago
E. C. Atkins Co., Indianapolis, Ind.
Meisner Mfg. Co., Syracuse, N. Y.
Skilsaw, Inc., Chicago, Ill.
Wyzenbeek and Staff, Inc., Chicago

SCRAPERS, hand and power
Anderson Bros. Mfg. Co., Rockford, Ill.

SCREW DRIVERS, power
Aro Equipment Corp., Bryan, Ohio
The Bodine Corp., Bridgeport, Conn.
Cincinnati Elec. Tool Co., Cincinnati, Ohio
Chicago Pneu. Tool Co., 6 E. 44th St., N. Y. C.
Detroit Power Screwdriver Co., Detroit
Errington Mech. Lab., Staten Island, N. Y.
Haskins Co., R. G., 623 S. California, Chicago
Ind. Pneu. Tool Co., Chicago, Ill.
Jarvis Co., Chas. L., Middletown, Conn.
Rotor Tool Co., Cleveland, O.
Sundstrand, N. A., Chicago, Ill
Stanley Works, New Britain, Conn.
Syntron Co., Homer City, Pa.

SCREW MACHINE PRODUCTS
See Contract Work

SCREW MACHINE REBUILDING
Modern Collet & Machine Co., Ecorse, Mich.

SCREW MACHINES, automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland, Ohio
Foster Mach. Co., Elkhart, Ind.
Greenlee Bros. and Co., Rockford, Ill.
National Acme Co., Cleveland, Ohio
New Britain Gridley Machine Co., New Brit., Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Triplex Machine Co., New York City
Windsor Automatic Co., Windsor, Vt.

SCREW MACHINES, plain and hand
Acme Machine Tool Co., Cincinnati, O.
Brown and Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Jones and Lamson Machine Co., Springfield, Vt.
W. H. Nichols Co., Waltham, Mass.
Rivett Lathe & Grinder Corp., Brighton, Boston, Mass.
Simmons Machine Tool Corp., Albany, N. Y.
Stevens, Inc., John B., 480 Canal St., N. Y. C.
Warner and Swasey Co., Cleveland, O.

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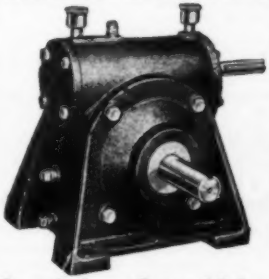

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Tool Eng. & Mfg. Co., Prov., R. I.

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Baumbach Mfg. Co., Chicago
Brighton Screw and Mfg. Co., Cincinnati, Ohio
Bristol Company, Waterbury, Conn.
Danley Machine Specialties, Chicago
Dardelet Threadlock Co., Broadway, New York City
Economy Machine Prod. Co., 5207 Lawrence, Chgo.
Groove Pin Corp., Union City, N. J.
John Hassall, Inc., Brooklyn, N. Y.
The Holo Krome Screw Corp., Hartford, Conn.
George W. Moore Co., Boston, Mass.
Ottemiller Co., Wm., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York City
Progressive Mfg. Co., Torrington, Conn.
Safety Socket Screw Corp., 4442 N. Knox Ave., Chicago
Standard Pressed Steel Co., Jenkintown, Penna.
Strong, Carlisle & Hammond, Cleveland, Ohio
Triplex Screw Co., Cleveland, Ohio

SCREWS, machine

Allen Mfg. Co., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Economy Machine Co., Chicago
Holo-Krome Screw Co., Hartford, Conn.
Lamson and Sessions Co., Cleveland, O.
Parker-Kalon Co., New York City

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Lamson and Sessions Co., Philadelphia, Pa.
Parker-Kalon Corp., New York City
Safety Socket Screw Co., Chicago, Ill.
Shakeproof Lockwasher Co., Chicago
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle and Hammond Co., Cleveland, O.

SCREWS, transfer

Nielsen Tool & Die Co., Berkeley, Mich.

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Robbins Engineering Co., Detroit, Mich.
Standard Shop Equipment Co., Philadelphia, Pa.

SHAFTS, flexible

Dumore Co., Racine, Wis.
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Mall Tool Co., 7742 So. Chicago Ave., Chicago
Matthews Mfg. Co., Newton, Iowa
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Stow Mfg. Co., Binghamton, N. Y.
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Lewis Machine Tool Co., Los Angeles, Calif.
Morton Mfg. Co., Muskegon Heights, Mich.
Ohio Machine Tool Co., Kenton, O.
Reed-Prentice Corp., Worcester, Mass.
Rockford Machine Tool Co., Rockford, Ill.
Sales Service & Mfg. Co., St. Paul, Minn.
Smith and Mills Co., Cincinnati, O.
Western Machine Tool Works, Holland, Mich.

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Atlas Press Co., Kalamazoo, Mich.
Automotive Maintenance Machy. Co., North Chicago, Ill.
Machinery Mfg. Co., Vernon, Cal.
Sales Service & Mfg. Co., St. Paul, Minn.

SHAPERS, vertical

Cochrane Bly Co., Rochester, N. Y.
Hanson-Whitney Machine Co., Hartford, Conn.
Marburg Brother, New York City
Morey Machinery Co., 410 Broome St., N. Y. C.
Morton Mfg. Co., Muskegon Heights, Mich.
Pratt & Whitney, West Hartford, Conn.
Rockford Machine Tool Co., Rockford, Ill.

SHEARS, hand

Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago
Beverly Shear Co., 3007 W. 110th Pl., Chicago
Bremil Mfg. Co., Erie, Pa.
Buffalo Forge Co., Buffalo, N. Y.
Klingelhofer, Inc., A., 103 Lafayette St., N. Y. C.
Marshalltown Mfg. Co., Marshalltown, Iowa
Niagara Machine and Tool Co., Buffalo, N. Y.
Peck, Stow and Wilcox Co., Southington, Conn.
Stanley Works, New Britain, Conn.
Whitney Mfg. Co., W A., Rockford, Ill.
Whitney Metal Tool Co., Rockford, Ill.

SHEARS, power

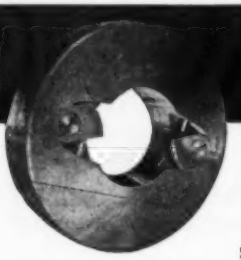
Beatty Mfg. & Mch. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati, O.
Excelsior Tool and Machine Co., E. St. Louis, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Niagara Machine and Tool Co., Buffalo, N. Y.
Peck, Stow and Wilcox Co., Southington, Conn.
Rock River Mch. Co., Div. of Hannifin Mfg. Co., Chicago
Ryerson & Son, Jos. T., 1600 S. Rockwell, Chgo

SHEARS, rotary

E. W. Bliss Co., Brooklyn, N. Y.
Consolidated Machine Tool Co., Rochester, N. Y.
Libert Machine Co., Green Bay, Wis.
Marshalltown Mfg. Co., Marshalltown, Iowa
Niagara Machine and Tool Co., Buffalo, N. Y.
Peck, Stow and Wilcox Co., Southington, Conn.
Quickwork-Whiting Corp., Harvey, Ill.

SHEARS, squaring

Beatty Machine and Mfg. Co., Hammond, Ind.
E. W. Bliss Co., Brooklyn, N. Y.
Cincinnati Shaper Co., Cincinnati, O.
Mitts and Merrill, Saginaw, Mich.
Niagara Machine and Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., Poughkeepsie, N. Y.



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Beverly Shear Co., 3007 W. 110th pl., Chicago
Marshalltown Mfg. Co., Marshalltown, Iowa
Ryerson & Son, Jos. T., 1600 S. Rockwell, Chgo.

SHEAVES
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American Pulley Co., Philadelphia, Pa.
Chicago Die Casting Mfg. Co., 2512 W. Monroe St., Chicago
Congress Tool and Die Co., Detroit, Mich.
Conway Clutch Co., Cincinnati, Ohio
Dodge Mfg. Corp., Mishawauka, Ind.
Medart Co., St. Louis, Mo.

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Maplewood Machinery Co., 2634 Fullerton, Chgo.
Niagara Machine and Tool Works, Buffalo, N. Y.
Peck, Stow and Wilcox Co., Southington, Conn.
Quickwork-Whiting Corp., Harvey, Ill.
Whitney Mfg. Co., W. A., Rockford, Ill.
Whitney Metal Tool Co., Rockford, Ill.

SHELVING, steel
Interior Steel Equipment Co., Cleveland, Ohio
Lyon Metal Prod. Co., Aurora, Illinois
Stackbin Corp., Providence, R. I.

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Akron Metallic Gasket Co., Akron, O.
Laminated Shim Co., Glenbrook, Conn.
National Motor Bearing Co., Oakland, Cal.
Victor Mfg. and Gasket Co., Chicago

SHOP ENVELOPES
Wade Instrument Co., Cleveland, Ohio

SHOP LIGHTS
Benjamin Elec. Mfg. Co., Desplaines, Ill.
Chicago Die Casting Mfg. Co., 2512 W. Monroe St., Chicago
Dazor Mfg. Co., St. Louis, Mo.
Vimco Mfg. Co., Buffalo, N. Y.
Zabora Machine & Gear Co., J., Charlotte, N. C.

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Erickson Steel Co., Cleveland, O.
J. C. Glenzer Co., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Midwest Tool & Mfg. Co., Detroit
National Twist Drill Co., Detroit, Mich.
Pratt & Whitney, West Hartford, Conn.
Scully-Jones Company, Chicago

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B. C. Ames Co., Waltham, Mass.
Baker Brothers, Inc., Toledo, Ohio
Consolidated Mach. Tool Corp., Rochester, N. Y.
Douglas Machinery Co., 150 Broadway, N. Y. C.
General Machinery Corp., Hamilton, Ohio
Rockford Machine Tool Co., Rockford, Ill.
Waterbury-Farrel Fdry. and Mach., Waterbury, Conn.

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L. B. Allen Co., Chicago
Ideal Commutator Dresser Co., Sycamore, Ill.
Imperial Brass Mfg. Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Stanley Works, New Britain, Conn.
Torit Mfg. Co., St. Paul, Minn.
Wayne Chemical Co., Detroit, Mich.

SOLVENTS, metal cleaning
Sun Oil Co., Philadelphia, Pa.

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Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Colson Corp., Elyria, Ohio
Crescent Tool Co., Cincinnati, Ohio
Esco Engineering Corp., Detroit, Mich.
Hack Machine Co., Desplaines, Ill.
Liberty Tool & Gage Works, Providence, R. I.
Lombard Governor Corp., Ashland, Mass.
Mac-Law Co., Syracuse, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Quality Tool & Die Co., Indianapolis, Ind.
Robbins Engineering Co., Detroit, Mich.
Sundstrand Machine Tool Co., Rockford, Ill.
Westlof Tool & Die Co., Detroit, Mich.

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Bodine Electric Co., Chicago
Brad-Foote Gear Works, Cicero, Ill.

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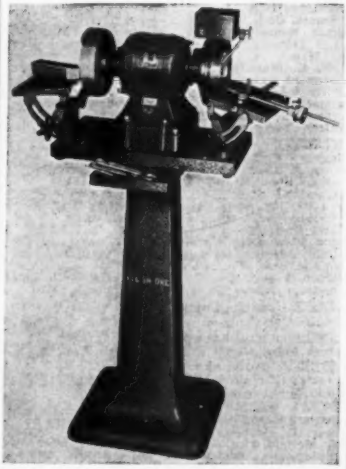

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K. O. Lee and Son, Aberdeen, S. D.
Ohio Gear Co., Cleveland, Ohio

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Baird Machine Co., Bridgeport, Conn.
John Bisner Co., Sharon, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

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Brown and Sharpe Mfg. Co., Providence, R. I.
Cullman Wheel Co., 1356 Altgeld St., Chicago
Dodge Mfg. Co., Mishawauka, Ind.
Link-Belt Company, Chicago
Philadelphia Gear Works, Philadelphia, Pa.

STAMPINGS

Acromark Corp., Elizabeth, N. J.
Dayton Rogers Mfg. Co., Minneapolis, Min.
Grand Haven Stamped Prod. Co., Grand Haven, Mich.
H. P. L. Manufacturing Co., Cleveland, Ohio
Laminated Shim Co., Long Island City, N. Y.
Quality Hdwe. & Mch. Co., 5831 Ravenswood, Chg.
Standard Pressed Steel Co., Jenkintown, Pa.
Sundstrand Machine Tool Co., Rockford, Ill.
Western Tool & Stamping Co., Des Moines, Iowa

STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, N. Y. C.
Cumberland Steel Co., Cumberland, Md.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Steel Co., Boston, Mass.
Inland Steel Co., Chicago
Jessop Steel Co., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Republic Steel Co., Cleveland, Ohio
Ryerson & Son, Jos. T., 1600 S. Rockwell, Chicago
Vanadium Alloys Steel Co., Pittsburgh, Pa.

STEEL, black finish

Du-Lite Chemical, Middletown, Conn.

STEELS, molybdenum

Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

STEELS, prefinished

American Nickeloid Co., Peru, Ill.
Apollo Metal Works, Chicago

STEEL STAMPS

Acromark Corp., Elizabeth, N. J.
James H. Mathews and Co., Pittsburgh, Pa.
New Method Steel Stamps Co., Detroit, Mich.
Schmidt, Inc., Geo., 1802 Belle Blaine, Chicago
Schwerdtle Stamp Co., Bridgeport, Conn.

STOOLS, factory

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTENING MACHINERY

Chambersburg Engineering Co., Chambersburg, Pa.
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engineering Works, Chas. F., 244 N. Morgan St., Chicago, Ill.
Greenerd Arbor Press Co., Nashua, N. H.
Hannifin Mfg. Co., Chicago
Sleeper & Hartley, Inc., Worcester, Mass.
U. S. Tool Co., Ampere, N. J.
Waterbury Farrel Fdry. and Machine Co., Waterbury, Conn.
Watson-Stillman Co., Roselle, N. J.

STUD SETTERS

Chicago Pneumatic Tool Co., N. Y. C.
Errington Mech. Laboratories, Staten Island, N. Y.
Independent Pneumatic Tool Co., Chicago
Modern Tool Works, Rochester, N. Y.
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago
Titan Tool Co., Fairview, Pa.

SUPERFINISHING MACHINES

Foster Machine Co., Elkhart, Ind.
Norton Co., Worcester, Mass.
Ohio Units, Dayton, Ohio

SURFACE PLATES

See Plates, Surface

TABLES, elevating

Lyon-Raymond Corp., Greene, N. Y.
Hamilton Tool Co., Hamilton, Ohio
O. Johnson Co., Brookfield, Ill.
Midwest Tool and Engineering Co., Dayton, Ohio

TABLES, rotary and circular

Geo. Gorton Machine Co., Mil., Wis.
W. S. Knight Mchy. Co., St. Louis, Mo.
Stevens, Inc., John B., 480 Canal St., N. Y. C.
Troyke, Alfred A., Cincinnati, Ohio

TAP EXTRACTORS

Walton Co., Hartford, Conn.

TAP HOLDERS

Alco Tool Co., Bridgeport, Conn.
Errington Mech. Laboratory, Staten Island, N. Y.
McCrosky Tool Corp., Meadville, Pa.
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago

TAPPING ATTACHMENTS

Ettco Tool Co., Brooklyn, N. Y.
Errington Mech. Laboratories, Staten Island, N. Y.
Jarvis Co., Chas., L., Middletown, Conn.
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago, Ill.

TAPPING MACHINES

Atlas Press Co., Kalamazoo, Mich.
Bakewell Mfg. Co., Los Angeles, Calif.
Bakewell Mfg. Co., Los Ang., Calif.
The Bodine Corp. Bridgeport, Conn.
Cleveland Tapping Machine Co., Cleveland, Ohio
Chicago Pneu. Tool Co., 6 E. 44th St., N. Y. C.
Cincinnati Elec. Tool Co., Cincinnati, Ohio
Delta Mfg. Co., Milwaukee, Wis.
Errington Mech. Lab., Staten Island, N. Y.
Ettco Tool Co., Brooklyn, N. Y.
Hamilton Tool Co., Hamilton, Ohio
R. G. Haskins Co., 623 S. California Ave., Chicago
Charles L. Jarvis Co., Middletown, Conn.
Kaufman Mfg. Co., Manitowoc, Wis.
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago

TAPPING MACHINES, portable

Chicago Pneumatic Tool Co., N. Y. C.
Cincinnati Elec. Tool Co., Cincinnati, Ohio
Ettco Tool Co., Brooklyn, N. Y.
Hamilton Tool Co., Hamilton, Ohio
Hisey-Wolf Machine Co., Cincinnati, Ohio
Ind. Pneumatic Tool Co., Chicago
Mall Tool Co., Chicago
Producto Machine Co., Bridgeport, Conn.
Rickert-Shafer Co., Erie, Pa.
Viking Tool & Machine Corp., Belleville, N. J.

TAPS

Chas. H. Besly and Co., Chicago
Greenfield Tap & Die Corp., Greenfield, Mass.
Geometric Tool Co., New Haven, Conn.
King Tap and Tool Co., North Attleboro, Mass.
Modern Tool Works, Rochester, N. Y.
Murchey Machine and Tool Co., Detroit, Mich.
Pratt & Whitney, West Hartford, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.
Rickert-Shafer Co., Erie, Pa.
Winter Brothers Co., Wrentham, Mass.

TEE BOLTS

Standard Shop Equipment Co., Philadelphia, Pa.

TEE-SLOT NUTS

Gorton Machine Co., Geo., Racine, Wis.
Standard Shop Equipment Co., Philadelphia, Pa.

TELESCOPES, industrial

American Cystoscope Makers, Inc., 1241 Lafayette Ave., (Bronx) New York

TESTING MACHINES

Brush Development Co., Cleveland, Ohio
Clark Instrument, Inc., Dearborn, Mich.
Detroit Testing Machine Co., Detroit, Mich.
Hartford Special Machinery Co., Hartford, Conn.
King, Andrew, Narberth, Penna.
Link Engineering Co., Detroit, Mich.
Magna Flux Corporation, Chicago
Modern Collet and Machine Co., Ecorse, Mich.
Physicists Research Co., Ann Arbor, Mich.
Pyro-Electric Instrument Co., Detroit, Mich.
Riehle Testing Machines Div., Am. Mach. and Metals Corp., East Moline., Ill.
Shore Instrument and Mfg. Co., Jamaica, N. Y.
Tinius Olsen Testing Machine Co., Philadelphia, Pa.
Wilson Mechanical Instrument Co., Inc., N. Y. C.

THREAD CUTTING MACHINES

(Also see Pipe Machines, Cutting and Threading: Milling Machines, Thread; and Grinders, Thread)

Delaware Mchy. Corp., 1790 Broadway, N. Y. C.
Geometric Tool Co., New Haven, Conn.

THREAD CUTTING MACHINES (Cont'd.)
Grant Mfg. and Mach. Co., Bridgeport, Conn.
Kaufman Mfg. Co., Manitowoc, Wis.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
National Acme Co., Cleveland, Ohio
Rickert-Shafer Co., Erie, Pa.

THREAD GRINDERS
See Grinders, Thread

THREAD MILLERS
See Milling Machines, Thread

TOGGLE CLAMPS
Detroit Stamping Co., Detroit, Mich.
Knu-Vise, Inc., Detroit, Mich.

TOGGLE PLIERS
Knu-Vise, Inc., Detroit, Mich.

TOOL BITS
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago
Barber-Colman Co., Rockford, Ill.
Illinois Tool Works, Chicago, Ill.
Jos. T. Ryerson and Son, Chicago
Simonds Saw & Steel Co., Fitchburg, Mass.

TOOL CHESTS
Circle Tip Tool Co., East Orange, N. J.

TOOL HOLDERS
Acme Tool Co., 125 Church St., N. Y. C.
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago
Auto Ordnance Co., Bridgeport, Conn.
Blake Co., Edward, Newton Centre, Mass.
Elk Tools, Inc., N. Y. C.
Jones and Lamson Machine Co., Springfield, Vt.
Lovejoy Tool Co., Springfield, Vt.
R. and L. Tools, Philadelphia, Pa.
Warner and Swasey Co., Cleveland, Ohio
Western Tool & Mfg. Co., Springfield, Ohio

TOOL SALVAGE
Abrasive Eng. Corp., Spring Lake, Mich.
Eastern Cutter Salvage Corp., Newark, N. J.
Master Tool Co., Cleveland, Ohio
Renu Tool Co., Detroit, Mich.

TOOLS, carbide
Carboloy Company, Inc., Detroit, Mich.
Circle Tip Tool Co., East Orange, N. J.
Comet Tools, 738 Broadway, N. Y. C.
Fansteel Metallurgical Corporation, North Chicago
General Tool and Die Corp., E. Orange, N. J.
Illinois Tool Works, Chicago
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit, Mich.
Modern Tools, E. Berlin, Conn.
Morse Tool Co., Detroit, Mich.
Super Tool Co., Detroit, Mich.
Willey's Carbide Tool Co., Detroit, Mich.

TOOLS, cutting
Armstrong Bros. Tool Co., 308 N. Francisco, Chgo.
Brown & Sharpe Mfg. Co., Providence, R. I.
Desmond-Stephan Mfg. Co., Urbana, Ohio
J. O. Glenzer Co., Detroit, Mich.
Michigan Tool Co., Detroit, Mich.
Thompson & Son Co., Henry G., New Haven, Conn.
Western Tool & Mfg. Co. Springfield, Ohio

TOOLS, cutting-off
Armstrong Bros. Tool Works, Chicago

TOOLS, cutting-off (Cont'd.)
Auto Ordnance Co., Bridgeport, Conn.
Brown and Sharpe Mfg. Co., Providence, R. I.
Empire Tool Co., Detroit, Mich.
Illinois Tool Works, Chicago

TOOLS, lathe & planer
American Tool Works, Cincinnati, Ohio
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe and Tool Co., Cincinnati, Ohio
Ex-Cell-O Corp., Detroit, Mich.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
R. K. LeBlond Machine Tool Co., Cincinnati, Ohio
Modern Tools, E. Berlin, Conn.
O. K. Tool Co., Shelton, Conn.
R. and L. Tools, Philadelphia, Pa.
Ready Tool Co., Bridgeport, Conn.

TOOLS, machinists'
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Miller Falls Co., Greenfield, Mass.
L. S. Starrett Co., Athol, Mass.

TOOLS, pneumatic
Chicago Pneumatic Tool Co., N. Y. C.
The Dallett Co., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago
Rotor Tool Co., Cleveland, Ohio
Vulcan Tool Mfg. Co., Quincy, Mass.

TORCHES, heating
Clements Mfg. Co., 6850 S. Narragansett, Chicago
National Safety Device Co., 836 W. Hubbard, Chg.
Torit Mfg. Co., St. Paul, Minn.

TOTE PANS
J. L. Lucas and Son, Bridgeport, Conn.
Lyon Metal Prod. Co., Aurora, Ill.
Pollard Brothers Mfg. Co., Chicago
Salem Tool Co., Salem, Ohio
Stackbin Corp., Providence, R. I.
Sterling Factory Equipment Co., Providence, R. I.

TRANSFORMERS
Elsler Engineering Co., Newark, N. J.
General Electric Co., Schenectady, N. Y.
Wagner Electric Corp., St. Louis, Mo.

TRANSMISSION, variable speed
See Drives, Machine Tool

TRUCKS
All Steel Welded Truck Corp., Rockford, Ill.
Barrett-Cravens Co., Chicago
Hamilton Tool Co., Hamilton, Ohio
Nutting Truck Co., Faribault, Minn.
O. Johnson Co., Brookfield, Ill.
Lyon-Raymond Corp., Greene, N. Y.
Metzgar Co., Grand Rapids, Mich.
Service Caster and Truck Co., Albion, Mich.
Yale and Towne Mfg. Co., Philadelphia, Pa.

TRUCKS, warehouse
All Steel Welded Truck Corp., Rockford, Ill.
Chas. E. Francis Co., Rushville, Indiana
Pollard Bros. Mfg. Co., 5505 N. W. Hwy., Chicago

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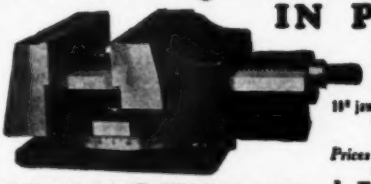

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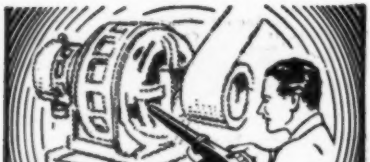

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Royersford Foundry and Mach. Co., Royersford, Pa.

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Jefferson Machine Tool Co., Cincinnati, Ohio
Specialties Mfg. Co., Bloomfield, N. J.

TURRETS, tool post
C. W. C. Corp., Hawthorne, Calif.
S. G. Colwell, Providence, R. I.
Jefferson Machine Tool Co., Cincinnati, Ohio
Milliken Machine Co., West Newton, Mass.

UNIVERSAL JOINTS
See Joints, Universal

USED & REBUILT MACHINERY
Aaron Machinery Co., 176 Lafayette St., New York, N. Y.
Acme Equipment Company, 128 S. Clinton St., Chicago, Ill.
Ogden R. Adams, Rochester, N. Y.
R. S. Armstrong & Bro. Co., Atlanta, Ga.
Atlantic Machinery Corporation, Att.: Mr. B. M. Volynsky, Pres., 149 Broadway, New York, N. Y.
Atlantic Machinery Exchange, 212 Centre St., N. Y. C.
Bansbach Machinery Corp., 3845 W. Madison St., Chicago
Bennett - Rafkin Machine Tool Co., Inc., 30 Church St., New York, N. Y.
Geo. M. Bernstein & Company, 12 S. Clinton, Chicago, Ill.
Blank & Buxton Machinery Co., Jackson, Mich.
J. Bleser Machinery Co., Springfield, Ill.
Botwinik Brothers, Inc., New Haven, Conn.
Bradley Machinery Company, Detroit, Mich.
B. D. Brooks Co., Inc., Boston, Mass.
Brown Machinery Co., St. Louis, Mo.
C. B. Burns Machinery Co., 541 W. Washington Blvd., Chicago, Ill.
F. W. Burns Machinery Co., Milwaukee, Wis.
Capitol Machinery Co., 401 Broadway, N. Y. C.
Cincinnati Machinery & Supply Co., Cincinnati, O.
Clinton Machinery Co., 32 S. Clinton St., Chicago
Daley & Sibley Machinery Dealers, Inc., New Haven, Conn.
Harry Dalitz, Cleveland, Ohio
C. R. Daniels, Milwaukee, Wis.
Davis Machinery Co., Toledo, Ohio
Delta Equipment Co., Philadelphia, Pa.
DeWitt Tool Company, 173 Grand St., New York
Dixie Mill Supply Co., New Orleans, La.
D. E. Dony Machinery Co., Rochester, N. Y.
The Eastern Machinery Co., Cincinnati, Ohio
Elyria Belting & Machinery Co., Elyria, Ohio
Louis E. Emerman & Co., 1761 Elston Ave., Chgo.
The E. L. Essley Machinery Co., 831 W. Evergreen Ave., Chicago, Ill.
Factory & Mill Supply Co., Inc., Boston, Mass.
Failor-Strafer Machinery Co., 136 Liberty St., New York, N. Y.
Falk Mill Supply Co., Rochester, N. Y.
Galbreath Machinery Co., Pittsburgh, Pa.
General Blower Co., 407 N. Peoria St., Chicago
Globe Machinery Co., 602 W. Lake St., Chicago
Harvey H. Goldman, Detroit, Mich.
Graham Machine Tool, Inc., 231 Centre, N.Y.C.
Grand Machinery Exchange, 148 Centre St., N. Y. C.
Hasco Machinery & Supplies, Inc., Newark, N.J.
Hill-Clarke Machinery Co., 649 W. Washington St., Chicago, Ill.
Jos. Hyman & Sons, Philadelphia, Pa.
Indianapolis Mchy. & Supply Co., Indianapolis, Ind.
Inland Machinery Co., 41 S. Clinton St., Chicago
International Machinery Co., Detroit, Mich.
Interstate Machinery Co., Inc., 109 S. Clinton St., Chicago, Ill.
Iroquois Machinery Co., Buffalo, N. Y.
Wm. C. Johnson & Sons Mchy. Co., St. Louis, Mo.
The Jones Machine Tool Co., Cincinnati, Ohio
E. L. Klauber Machinery Co., St. Louis, Mo.
Mr. John Green, Lafayette Machine Corp., Detroit Mich.
Lake Machinery Company, 654 W. Lake St., Chicago, Ill.
Lang Machinery Co., Pittsburgh, Pa.
Laurens Brothers, Att.: Mr. Frank Laurens, Cincinnati, Ohio

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Leach Machinery Co., H. Providence, R. I.
Long Machinery Corp., Boston, Mass.
Chas' E. Lowe Company, Hartford, Conn.
Lucas & Co. Austin, D., Bridgeport, Conn.
J. L. Lucas & Sons, Inc., Bridgeport, Conn.
McCabe & Sheeran Mchy. Co., 50 Church St., New York, N. Y.
McDonald Machinery Co., St. Louis, Mo.
Manning, Maxwell & Moore, Boston, Mass.
Miles Machinery Co., Saginaw, Mich.
Morey Machinery Co., Inc., 410 Broome St., New York, N. Y.
Morris Machinery Co., Newark, N. J.
Moser Machine Tool Sales, Att.: Mr. Carl Moser, Jr., Milwaukee, Wis.
Nelson Machinery Company, Green Bay, Wis.
North Machine Tool Corp., 1790 Broadway, N.Y.C.
Norton Broadway Mchy. Co., Cincinnati, Ohio
O'Brien Machinery Co., Philadelphia, Pa.
The Osborne & Sexton Machinery Co., Columbus, O.
Ott Machinery Sales Co., Detroit, Mich.
Patron Transmission Co., 156 Grand St., New York
Mr. H. Pelz, 5140 Woodlawn Ave., Chicago
Reeve-Fritts Co., 28 N. Clinton St., Chicago, Ill.
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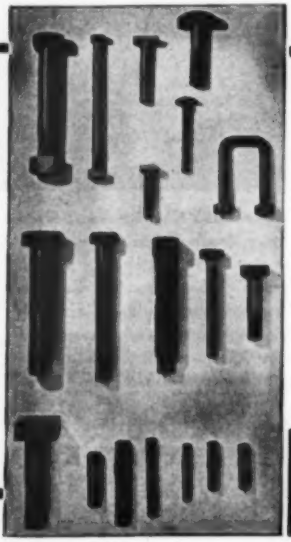

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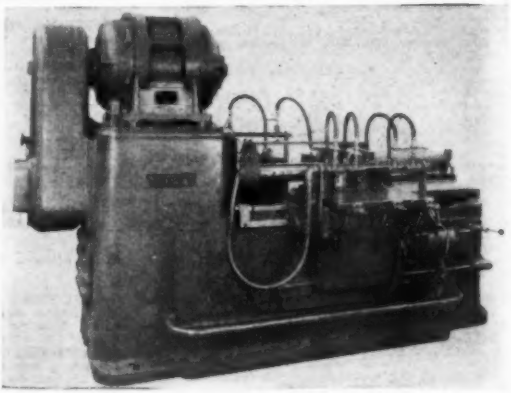
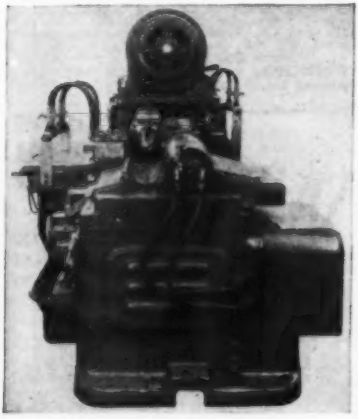
Morey Develops New Series of Shell Lathes

A second series of Shell Lathes, especially suited for heavy duty operation, has been developed by Morey Machinery Co., Inc., 410 Broome St., New York, N. Y.

These machines differ from the original model in several details:

1—The rear tool holders are complete, entire separate units, including their feeding mechanism. They can be attached at any time after lathe is built and are adjustable longitudinally to suit the work.



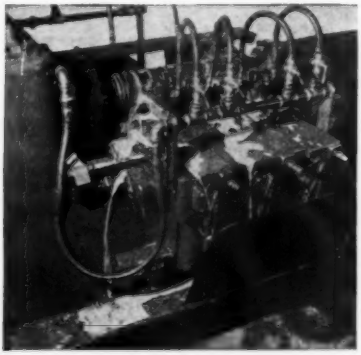


With this the following important advantages are realized as explained by the manufacturer:

a—Separate feeding adjustment to the rear tools.

b—Tools held so rigidly that no vibration is created by either the cut-off or forming tool.

2—A bed plate similar to a floor plate is now furnished, which not only acts as a substantial foundation for the bed, headstock, tailstock support and hydraulic pumps but serves as a reservoir for the hydraulic oil and cutting lubricant.



3—Speed Variation:-A mechanical shift in addition to the pick-off gears was provided to make it possible to change the machine over immediately for carbide tools to high speed tools or vice versa.

4—Net weight has been increased nearly 2000 lbs.

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- ☐Lathes, auto.

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- ☐ Lathes, polishing & buffing
- ☐ Lathes, shell
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- ☐ Tapping Machines, portable
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- ☐ Testing Machines
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- ☐ Valves, hydraulic
- ☐ Vises, bench
- ☐ Vises, machine
- ☐ Vises, machinists' bench
- ☐ Vises, pipe
- ☐ Vises, planer & sh.
- ☐ Vises, universal
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- ☐ Welders, engine driven
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- ☐ Welding controls
- ☐ Welding rods
- ☐ Wire Forming Machines
- ☐ Wire Straightening Machines
- ☐ Wire-Working Machinery
- ☐ Wrenches
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Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 45c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY

Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

Automatic screw machines, Cleveland, Model A, 1¼", ⅝", ¾", ⅞", 2", 2½".
Borer, Rockford 3" horizontal.
Drills, radial, 3' Morris, 3½', 4' Mueller, m.d.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. & Shuchardt & Schutte.
Gear hobbers, Barber-Colman, No. 2, 3.
Gear shaper, No. 6 Fellows.
Grinders Brown & Sharpe No. 1, 2, universal, 11.
Grinders, Bryant No. 6 internal.
Grinder, Churchill-Morgan internal.
Grinders, No. 55, 60, 65, Heald internal.
Grinders, 8" Persons-Arter Rotary.
Grinder, P. & W. 12" vertical.
Grinder, Walker 10" rotary.
Grinders, Greenfield No. 51 Hydroil int.
Grinders, Landis, m. d., 12x36".
Grinders, Modern, m. d., 12x24", 12x42".
Hammers, Pettingell trip, No. 1, 2.
Lathes, 16x8, 18x8, 18x10", quick change.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, Hendey, yoke, 14", 20".
Lathe, 24x10' Wickes Bros., q.c., 3 step cone, heavy
Lathe, 24x10' Crawford, 3 step cone, heavy.
Lathe, 24x10' Reed-Prentice, grd. head, m.d.
Lathe, 24"x14' Reed-Prentice, geared head.
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
Bardons & Oliver No. 2, 4.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
Miller, LeBlond No. 2½, plain.
Screw machine, Cleveland ⅝" Model A & 2½".
Shaper, Ohio 16", s.p.d.
Shapers, crank, 14", 16", 20", 21", 26".
Shaper, Lynd-Farquhar, open side, m.d.
Turret lathes, Gisholt, 26", 21".
Turret lathe, P & W., 24x26" grd. hd., s. p.d.
Turret lathe, W. & S. No. 2, 6.
Turret lathe, J. & L., 2½, 3½".
Hydraulic pumps, presses, accumulators.

Wisconsin Gear & Engineering Co., Inc.
602 S. Second St., Milwaukee, Wis.

Bilgram bevel gear generator, 16". Guaranteed to be in A-1 condition, with all change gears & segments.

FOR SALE BY

Siegman Machinery Co., Inc.
561 W. Washington Blvd., Chicago, Ill.

Automatic, Gridleys, 1½", 4 spindle.
Automatic, Gridleys, 1¼", 4 spindle.
Boring mill, Rock, horiz., 3" bar.
Boring mill, Morris horiz., 3" bar.
Grinder, Bryant No. 16A.
Grinder, Heald, 65, internal, Like new.
Grinder, Modern self contained, 16"x60", m.d.
Grinder, worm gear, Pratt & Whitney, m.d.
Lathe, 26"x12' Schumacher-Boye, quick change.
Miller, vertical, Becker No 5B, power feeds.
Pipe bender, Wallace, 2" cap.
Tapping machine, Garvin No. 2.
Thread cut., Coul. auto. 6' g.h. 5"x24" s.p.d., steel pans
Turret lathes, J. & L., 2x24, (3); 3x36, (1).

Please send us your inquiries.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Carburizing furnace, Rotary, Rockwell.
Disc grinder, 18" Besley, arranged for m.d.
Grinders, cutter & tool.
Gear hobber, No. 000 Schuchardt & Schutte, 4".
Lathes, bench precision, ⅜" & ½" collet cap.
Lathes, 14"x8', 18"x8', motor drive.
Millers, hand, U.S., Miller & Crowningshield.
Polishing machines, No. 11 Hanson-Van Winkle.
Press, No. 69 N Bliss O.B.I., double action.
Threading machine, 2" Landis, single head.

R. S. Armstrong & Bro. Co.
676 Marietta St., N. W., Atlanta, Ga.

Bolt machine, 1½" Acme, cone drive.
Grinder, No. 4 Excelsior, belt drive.
Grinder, Sellers tool, tub type, belt.
Keyseater, No. 2 Mitts & Merrill, belt.
Lathe, 13"x6' Davis, q.c.g., d.c., m.d.
Lathe, 18"-26"x12' South Bend, l.c.g., c.d.
Lathe, 24"x16' Reed, l.c.g., c.d.
Lathe, 18"x16' L&S, q.c.g., open gd. hd., m.d.
Lathe, 24"x12' L&S, q.c.g., open gd. hd., m.d.
Pipe machine, 8" Curtis (Forbes type) b.d.
Shaper, 24" Stockbridge, b.g., c.d.
Shear, No. 22 Buffalo slitting, hand.
Shear, Thompson bevel patch, 4" cap., b.d.

USED AND REBUILT MACHINERY

FOR SALE BY

Bullock Iron Works
3001 Tatnall St. Wilmington, Del.

WANTED

100 pound Little Giant hammer, motor drive.
Must be A No. 1 Condition. No junk.

Fuchs Machinery & Supply Co.
1102-4 Farnam St., Omaha, Nebraska

Automatic, 7/8 Model A Cleveland.
Automatic, 2¼ Model A Cleveland.
Automatic, No. 52 National Acme, 4 spindle.
Automatic, No. 55 National Acme, 4 spindle.
Drill, 2 spdl. Henry Wright, 15" overhang, prod. table.
Drill, 4 spdl. 20" b. g., p. f., V belt motor drives.
Grinder, Micro internal cylinder, m. d.
Grinder, Norton universal tool.
Grinder, pedestal, 7½ h.p., U.S.
Hammer, Pettingell, post type.
Hammers, 25, 50 & 100 lb. Little Giant.
Miller, No. 1 U. S. hand.
Miller, No. 1 Burke hand.
Miller, No. 2 Garvin plain.
Miller, No. 3B Milwaukee, plain.
Presses, o. b. i. Nos. 1, 2 3, 5.
Press, No. 6-E Rockford double crank.
Press, No. 84 DAG Ferracute, double acting cam.
Shear, No. 2 Ryerson serpentine.
Shear, 60" Pexto power.
Shear, ½" Kling plate splitting.
Shaper, 20" Smith & Mills, single pulley drive.
Tapper, No. 2BC Garvin vertical.

Alex Zeeve & Company
2269 Woolworth Bldg., New York, N. Y.

Bolt threaders, 4" Landis, 2" Acme "Class A", 1¼" National.
Boring mill, vertical, 51" Bullard, 2 heads, m.d.
Cylinder boring mill, horiz., 7" bar, swings 96" over bed.
Drill, radial, 3' Mueller, gear box, s.p.d., box table.
Gear hobber, 24" Rhenania, universal.
Hammers, power, 500 (2), 400 and 300 lb. Beaudry "Champion".
Hammer, steam, 250 lb. Niles-Bement-Pond, sgle. fr.
Ironworkers, comb.—No. MK-10 Pels, armor-plate, with coper, portable, on wheels, ac-md., new in 1934.
No. 3-R Rock River, armor-plate, with coper, a. c., m. d., new in 1937.
Keyseaters, No. 3 Mitts-Merrill, No. 2, 1, & 0 Baker.
Lathes, engine—29"x20' Rahn-Mayer-Carpenter semi-q.c. 30"x12' H.S.&G., q.c.g.; 29"x16' Walcott, q.c.g., taper.; 24"x16' Whitcomb-Blaisdell, q. c. g., taper; 22"x11' Lehmann, 16 speed gd. hd., md, taper.; 21"x12' LeBlond, 12 speed gd. hd., m.d., taper.; 20"x10' Lodge & Shipley, q. c. g., bowl head, 18"x10' Lodge & Shipley, 12 sp. sel. g.h., s.p.d., tap. 16"x6' Kimball-Walcott, 12 spd. gd. hd., spd., others.
Miller, No. 6 Whitney, hand, a. c., m.d.
Planers, 36"x36"x14' Woodward-Powell, 1 rail head, 1 side hd.; 36"x36"x10' Pond, 2 rail hds., 2 side hds.
Roll angle bending—No. 7 Bertsch, 2"x2"x¼" cap. also bends tees, channel, and ¾", 1" & 1¼" pipe.
Shapers, 24" Steptoe hvy. duty, b.g., cone, 16" Smith & & Mills, vee-ram, gear box, a.c., m.d.
Shears, squaring, 10½"x3/16" Sonntag all-steel; 30"x¼" Stoll, a.c., m.d., Shears throatless, ½", Marshalltown a. c., m.d.; ½" Ryerson, b.d.; ¾" Ryerson, a. c., m. d., Shears misc. 8 x¼" Lennox rot. spliting., a. c., m. d.; 60" Yoder rotary, 14 gauge capacity.
Tapper, No. 8 Gaterman pneu. oscillating, ¾"-4" cap.
Turret lathe, 2"x26" Pratt & Whitney, b. g., hex turret, with cross-slide.

ALSO MANY OTHER TOOLS.

FOR SALE BY

Chas. T. Hamilton Machine Shop
325 N. Jackson St.. Decatur, Ill.

Drill press, 20 champion upright, m. d., twelve large drills, all new, $275.
Engine lathe, 18"x8' Boye & Emmes, q. c. taper and motor drive, $1900, in fine condition.
Lathe, 16"x6' Hendy, taper and m. d., $1450.
Shaper, 20" Ohio, motor drive, $1450.
Can be seen in operation

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Boring mill, Bickford, hor. spd., g. b., tbl. type No. 232.
Boring mill, Binsee No. 78 hor. knee type, 3½" spindle.
Boring mill, Niles 36" 2 swivel heads.
Drill, Barnes upright 20" 3 spindle, one tapping att.
Drill, Sigourney 4 spd. also various other upright drills.
Drill, presses, all sizes and kinds.
Drill press, Foote Burt 24", heavy duty.
Drill, radial, 5' Harrington.
Grinder, Bridgeport, face, 36" wheel, 11' bed.
Hammer, Lingle 50 lb. power, arranged m. d.
Keyseater, Morton 18"
Lathe, New Haven 24", 14' bed, q.c., taper attach.
Lathes, LeBlond 17" & 19" rapid prod. q. c. feeds, (2).
Lathes, National 18" production, (3)
Lathe, Gisholt, 24", hole in spindle 6".
Lathe, Bement Miles, l. c. g., 36" factory raising blocks to 42", centers 17', bed 22', c. d.
Lathe, Bullard 22", Loose change. turret head.
Lathe, Mueller 20" quick change, 4 way tool post.
Lathe, Jones and Lamson 2½x24".
Miller, No 2½ Hendey Lincoln type.
Miller, No. 3 Lees-Bradner, thread.
Punch, double end power, ¾ capacity.

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

BORING MILLS AND MILLERS

10' Niles vertical, 2 hds.
No. 4 LeBlond univ. miller, cone drive.
No. 1½ Amer. pl. cone dr.
No. 3 B. & Sharp, plain.

LATHES

14"x6' Mon. q. c., d. b. g.
16"x10' L&S. 3 step, dbg.
18"x10' Mueller, q. c. 3 step, d. b. g.
19"x12' Boye & Em., q.c.
24"x12' New Haven, q.c., cone drive.
20x"8' Whit. 3 stepd. b.g.,
q. c.
20"x8' Am. 3 st. q.c., d.b.g.
18"x12' Whit. c 3 st. q. c., d b. g.
18"x12' Spring. c., s. b. g.
24"x8' S. & B., l.c., s.b.g.
20"x10' LeB. l. c. c. d.

SHAPERS AND PLANERS

16" Cin. b. g. cone dr.
24" G. & E., cone drive.
24" Smith & Mills. c.d.
24" Cin. b. g., cone dr.
24" American, cone dr.
30"x30"x8' Am. pl. 1 hd.
36"x12' American, 1 hd.
36x16' Putnam planer, 1 rail & 1 side head.

PRESSES AND SHEARS

No. 76 Tol. s. s. b. g.
No. 1 L. & A. dble. end
Wickes, sgle. end punch, 26" throat.
No. 15 Tol. deep throat
52" Foot square shear.
No. 44 Niagara dp. thrt.
Robinson s. s. press, 16" bet housings.

MISCELLANEOUS

18" Gleason gear gen.
36" & 48" B. & S. gear cutters.
Style "F" Bak. h.d. drills.
No. 2 M. & M. Keyseat.
2'—Amer. radial, s.p.d.
3'—Mueller radial, s.p.d.
12"x12" Racine hk. saws.
6x6 Peerless hack saw.
15 & 20 k. w. spot weld.
No. 2 Oakley t &c. grind-
No. 7 B. & O., tur. lathe.
16" Dreses 1½" turret.
150 t. Firestone hyd. pr.
2" Acme bolt cutter.

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

Air compressor, N-S03 Chicago, 492 d.f., oil dr.
Air compressor, Ing. Rand ER-1 148 c f., b.d.
Air compressor, 10"x10" Ing-Rand, 209 c f., m.d.
Bolt cutter, 1" Landis, 14"-3"sgl. hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Bolt cutter, staybolt 1¼" Acme, leadscrew, m.d.
Boring mill, horiz. Barret 3½" b.d.
Boring mill, horiz., 5" bar Barrett, b.d.
Boring mill, vert. 42" Bement Miles, 2 hds., b. d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Crane, 5 ton OET, 43 6" span, m.d.
Column facer, 30" dia. Espen Lucas, b.d.
Cut-off machine, 16" Treadwell, m.d.
Die filer, Rearwin, tbl. 18"x17", str. 8".
Die filer, No. 3 Thiel, m.d.
Draw bench, Aetna-Standard, 25,000 lb., 36' long, m.d.
Drill, 2-spindle Woodward-Rogers, m. d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill, mult. 10 spindle D-12 Fox, b. d.
Drill, radial, 2½" Mueller, t.a., m.d.
Drill, radial, 3½" Prentice, t. a., b. d.
Drill, radial, 3" Bickford, t. a., m. d.
Drills, upright, 11" to 34", b. d. & m. d.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, 40"x12" G & E, s.p.d.
Gear cutter, spur, 84" Newark, m. d.
Gear miller, No. 1 Bilton, cap. 4", b. d.
Gear planer, 36" Gleason, bevel, m.d.
Gear planer, 84" Gleason, bevel, m. d.
Generator, 100 KW Westinghouse d. c., 125 v. b. d.
Generator, 150 KW Jeffrey, d. c. 250 v. b. d.
Grinder, cyl. No. 14 Brown & Sharpe, m. d.
Grinder, cyl. Wells 6"x14", m. d.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, dbl. end, 24" Marschke, m.d.
Grinder, d. e. 12" Marschke, m. d.
Grinder, drill, No. 5 Oliver, m. d.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, worm-hob, Pfauter "FS", b.d.
Grinder, cyl., 16"x30" Landis, b.d.
Grinder, No. 60 Heald, b. d.
Hammer, 50 lb. Little Giant, s. p. d.
Hammer, power, 300-lb. Bradley, upright helve.
Hammers, steam drop, 400-lb. to 8000-lbs
Hammers, steam forging, 800 lbs.—6000 lbs.
Hoist, electric 5 ton Euclid, a. c. m. d.
Keyseater, No. 3½ Baker, 3½", m. d.
Lathe, 13"x6' Smith, semi-q. c. g., d. b. g., b. d.
Lathe, 14"x6' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 14"x8' Monarch, q. c. g., d. b. g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x8' Emmes, p. c. g., s. b. g., b. d.
Lathe, 16"x8' Rockford, semi-q. c. g., s. b. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 16"x24"x8' So. Bend, gap, b.d.
Lathe, 17"x8' LeBlond, q.c.g., d.b.g., b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x8' Bradford, p. c. g., s. b. g., b. d.
Lathe, 18"x8' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 18"x10' Hendey, q. c. g., b. d.
Lathe, 20"x8' Reed, p.c.g., s.b.g., b.d.
Lathe, 20"x10' Hamilton g. d. head, q. c. g., s. p. d.
Lathe, 21"x8' LeBlond hvy. duty, d. b. g., b. d.
Lathe, 24"x16' Bradford, t.a., b.d.
Lathe, 27"x11' LeBlond, grd. hd., q.c.g., d.b.g., m.d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d.b.g., b. d.
Lathe, 28"x14' Putnam hvy. duty, d.b.g., b.d.
Lathe, 36"x18' American, p. c. g., t. a. b. d.
Lathe, 36"x26'6" New Haven, p. c. g., b. d.
Lathe, 42"x22' American, b.d.
Lathe, 42"x 20' Springfield trip. grd., p. c. g, b. d.
Lathe, 42"x 17'7" Pond, triple grd., p.c.g., b.d.
Lathe, 48"x22½" Johnson, trip.gd. int .face pl. dr. b.d.
Lathe, 48"x26½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, wheel 78" Bement-Miles, m. d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 18" Reed, h.s., 1½", p. f., b. d.
Lathe, turret No. 3 Foster, h. s. 1¼", b. d.
Lathe, turret Acme 1¼"x9", h. s. 1¼", b. d.
Leveller, 84" Bertsch 7 rolls, m. d.
Miller, plain No. 14 Garvin, tbl. 43½"x13½", b.d.
Miller, vert. No. 2 Becker, tbl. 30"x8½", m. d.
Miller, thread, Smalley General, cap. 12"x36", m. d.
Miller, hand No. 3 Rockford, tbl. 18"x4½", b. d.
Miller, plain No. 12 B & S., tbl. 37"x10", b. d.
Miller, slab, Ingersoll tbl. 9½"x21", b. d.
Miller, Vert. Taylor & Fenn, tbl. 24½"x6", m. d.
Pickling machine, Mesta, 8-12' arms.
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Pipe machines, 2"—4"—12" & 18" Weilano, b. d.
Planer, 24"x24"x5' New Haven, 1 head, b.d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x10' American, 2 heads, m. d.
Planer, 36"x36"x11' Sellers, 2 heads, rev. m.d.
Planer, 42"x42"x12' Gray, 4 heads, b. d.
Planer, 48"x48"x12' Sellers, 4 heads, m. d.
Press, double acting, No. 1 Bliss, roller feed,
Press, dbl. cr., 96-F Toledo, 12" str., Bolster 65"x124"
Press, end wheel Stiles-Parker, stroke 1½".
Press, hydraulic, 100 ton, Watson-Stillman, m. d.
Press, 250 ton Baldwin Southwark 4-post.
Press, forging, 1500 ton Farrell-Birmingham, m.d.
Press, o. b. i. No. 68-C Bliss, stroke 5".
Press, O. B. I. No. 2 Loshbaugh-Jordan, stroke 2".
Press, perforating, No. 5 V & O, str. 8", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Press, toggle, No. 1½ Bliss, m.d.
Pump, Worthington 9"x2"x12", 22 gpm 3000 lb. steam.
Punch, lever, No. 58 Niagara, 36" throat.
Punch, mult. 10' L & A, cap. 340 tons pressure.
Punch & shear, No. 3 L & A, ram act ¾"-1".
Punch & shear, Cleveland EF, 1½" thru 1", b. d.
Punch & shear, Cleveland "G", 2" thru 1", m. d.
Punch, No. 2 H & J, d. e., thrt. 36", 1" thru 2", m. d.
Punch, No. 3 H & J, d. e., thrt. 36", 1½" thru 1", m. d.
Punch, No. 3 H & J, thrt. 48", 1"-1", m.d.
Punch, No. 4 H & J, 1" thru 1", m. d.
Riveter, pneu., Hanna, 30 ton, 75" reach.
Riveter, pneu., Hanna, 80 ton, 126" reach.
Riveter, pneu., Hanna, 150 ton, 150" reach.
Saw, band Type J M Laidlaw, 20", m. d.
Saw, cold, Espen Lucas, blade 22", cap. 6" rd.
Shaper, draw-cut 48" Morton, m.d.
Shaper, traveling head, 50", Bement, m.d.
Shaper, 16" Cincinnati hi-duty, m. d.
Shear, allig., Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, circle, No. 00 Niagara, b. d
Shear, allig., No. 4 D&K, cap. 5", m.d.
Shear, foot Niagara 36"x18 gauge.
Shear, plate, 72"x1½" United, m. d.
Shear, plate, 119"x¾" Wheeling, gap. 15", m.d.
Shear, plate, 10'x¾" Pittsburgh, gap. 15½", m. d.
Shear, plate, 96"x¾" Mesta, thrt. 25", s.d.
Shear, plate, 125"x3/16" Hyde Park, gap 15", m.d.
Shears, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 15", m.d.
Shear, plate 132"x1¼", throat 51", m. d.
Shear, plate 132"x1¼", throat 24", m. d.
Shear, plate, 96"x1¼" Morgan, m.d.
Shear, sq. 84"x3/16", Hyde Park, thrt. 8½".
Shear, sq. 84"x3/16", Wheeling, thrt. 9".
Shear, sq., 36"x¾" United, b.d.
Shear, squaring, 72"x18 ga. Streine, m.d.
Slotter, 18" Bement, table 36" b. d.
Upsetter, 4" Ajax, steel bed, m.d.
Upsetter, 2½" Acme, steel bed, m.d.
Vertical attachments, Nos. 1, 3, 4 and 5 millers.
Straight'ner, shape, No. 3 Sutton, 2-way, cap. 2½", m.d.
Tapping machine, duplex Garvin 2-X, ½"-1", b.d.
Thread Miller Smalley General, cap. 14"x3", m.d.
Welders, 150 amps, and 200 amps, portable.

USED AND REBUILT MACHINERY

FOR SALE BY

C. R. Daniels

1514 W. Capitol Drive, Milwaukee, Wis.

Arbor press, No. 5 Greenerd, 12 ton.
Blue print machine, Pease full cylinder.
Chuck, Size B Wizard, with 6 collets.
Drill grinder, Type A Yankee, b.d.
Planer, 22"x22"x5' Wheeler, b.d.

Woodworkers Tool Works

220 S. Jefferson St., Chicago, Ill.

Grinder, Covel-Hanchett, automatic, for circular metal saws 8" to 34" diameter, index feed, b. d. ..... $250.
F.O.B. Chicago.
Patternmaker's lathes, 16" and 20", rebuilt.

Wishbow Brothers, Inc.

696 Communipaw Ave., Jersey City, N. J.

WANTED

Crankshaft grinder, Landis No. 4A spec. or No. 4. State price, serial number and condition; also equipment.
Have Heald No. 50 cyl. grinder for sale, No. 141 hydraulic.

Foster Machinery Co.

3982 Bluestone Rd. Cleveland, O.

Bulldozer, Williams & White No. 4, double end.
Forging roll, No. O.C. Ajax.
Lathe, 14x6 Monarch, q. c. g.
Punch, Long & Alstatter, 36" throat, 1¼" cap. arch jaw.
Punch, EF Cleveland, 36" throat, 1¼" cap. arch jaw.
Saw, 6" Newton, cold.

B. D. Brooks Co., Inc.

361 Atlantic Ave. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Bending rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

Russell Machine Co.

438 Oliver Bldg. Pittsburgh, Pa.

Bulldozer, No. 4 Wms. & White, m.d.
Boring mill, 42" Niles vert., sgl. head.
Gear cutter, spur, 84" Newark, m.d.
Gear planer, bev., 54" Gleason m.d.
Gear planer, Revere, 36" Gleason, b. d.
Hammer, 300 lb. Bradley, upright strap.
Lathe, 42"x17'6" rond, p.c.g., triple grd., b.d.
Lathe, flat turret, 24"x24" J&L, grd. hd., s.p.d.
Press, hydraulic, 100 ton Watson Stillman, m.d.
Punch, multiple, style "E" L&A 1½" th. cap. 340 tons.
Punch, beam, Cleveland, cap. 24".
Punch & Shear, Cleveland EF 1¼" thru 1", b.d.
Punch & Shear, No. 3 H&L dbl. end, 1" thru. 1", m.d.
Shaper, 24" Walcott, b.g., b.d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Shear, No. 4 L&A squaring, cap. 8'x3/16".
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

FOR SALE BY

Standard Machinery Co.,

347 Indiana Ave. Grand Rapids, Mich.

Automatic, ⅜"—½" Cleveland, single spindle.
Cut-off, abrasive, Tannewitz type M-2.
Drill, 40" New Haven No. 5, sliding head.
Gear cutters, Whiton No. 14 automatic, (2).
Grinder, cylinder, Heald No. 65.
Keyseater, No. 0 Mitts & Merrill.
Lathes, mfg., 12"x6' Pratt & Whitney, (2).
Lathe, 24"x8' Lodge & Shipley, d.b.g., q.c.g.
Saw, Peerless 6"x8" high speed.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable spot, 50 KVA.

The Elyria Belting & Machinery Co.

Elyria - - - - - Ohio

PRESSES

No. 21 Bliss geared, 5" stroke.
No. P21 Ferracute, with motor.
No. 4 R&K, stroke 2½".
No. 204-E Toledo, stroke 2½".
No. 3 Bliss, plain, 1½" stroke.

D. E. Dony Machinery Co.

47 Laurelton Rd., - Rochester, N. Y.

Drill, 4-spindle, Demco 12" overhang, m.d.
Gas cutting machine, No. 7 Oxygraph.
Lathe, 16"x8' Illinois.
Press, No. 73½ Bliss, s. s. geared.

Reliance Machinery Sales Company

1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson, toggle.
Bulldozer, No. 4 Williams-White.
Crane, Caterpillar, 75' boom, gas, Northwestern.
Grinder, 12x32" Bath univ.
Grinder, No. 14 Besley double disc, 26" discs.
Hammers, 50 lb. Mayer, 40 lb. Bradley helve.
Lathe, 36"x18' New Haven, plain change.
Lathe, 27"x15' Prentice, taper, arr. m. d.
Miller, model C Becker vertical, m.d.
Miller, 30"x10' Newton slab, m. d.
Press, No. 82-C Toledo dbl. crank, 44" wide, 5" shaft, 2" stroke, m. d.
Pump, Goulds centrifugal, 3 stage, 250 g.p.m. against 347' head, m. d., 3-60-220 v.
Pump, hydraulic, 15 G.P.M., 1500 lb., m.d.
Punch, 48" throat Whiting, 1" thru 1", arch. jaw.
Swaging machine, No. 5 Etna, cap. 3" tubes.

What do you need? What have you for sale?

The Nutmeg State Machinery Corp.

1041-1051 State St., New Haven, Conn.

Grinder, Internal, Taylor & Fenn, self contained, complete, Excello spdle.
Grinder, Diamond No. 1 automatic surface, complete.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Cincinnati, 12"x36" universal.
Thread millers, Pratt & Whitney 6"x48", complete with gears, pumps, tanks, countershafts, (2).

USED AND REBUILT MACHINERY

FOR SALE BY

The F. E. Worch Machinery Co.
P.O. Box 202 2049 Westover Rd.
Columbus, Ohio

Drill, No. 1 Avey bench.
Drill, 4 spindle Francis Reed, ½".
Grinder, plain, Ott 8"x18".
Grinder, tool, No. 30W Sellers.
Lathe, 18"x8' Hamilton, q.c.g., cone.
Lathe, 20"x14' American, q.c.g., cone.
Planer, 30"x30"x8' Ohio, 1 head.
Planer, 32"x32"x12' Gray, 1 head.
Press, o.b.i., 42 ton pressure.
Shaper, 20" G&E, cone.

Wayne Tool & Engineering Co.
Fort Wayne, - - - Indiana

Drill, Natco four-spindle.
Gear cutter, 18" Gleason beveled.
Gear cutter, Brown & Sharpe, No. 3, 26", No. 786.
Gear cutter, Brown & Sharpe No. 4, 38" auto., No. 406.
Gear hobber & cutter, No. 2 universal, Adams-Farwell, No. 110-S.
Gear hobber, Barber-Colman No. 12, No. 1013.
Gear shaper, No. 6 Fellows, No. 4358.
All equipment in good usable condition ready for immediate inspection and shipment.

FOR SALE BY

Jenkins Interlock Mfg. Co.
443 N. Thirteenth St., Philadelphia, Pa.

Drill press, 24" table.
Hack saw with angle vise.
Hack saws, small, power, (2).
Lathe, engine, 12"x8', quick change.
Lathe, engine, 18"x8' plain change.
Lathe, engine, 30"x6', plain change.
Miller, No. 9 Kempsmith, geared m.d.
Winch, hand power.

North Machine Tool Corp.
1790 Broadway 29-26 40th Road
New York, N.Y. Long Island City, N.Y.
Circle 5-5191 STillwell 4-1420

Gear generator, 18" Gleason straight bevel.
Gear hobber, No. 00 Pfauter.
Grinders, 10"x24" Landis, direct m.d. plain, cyl.; No. 12 Brown & Sharpe, plain cyl.
Lathes, 18"x6' American arr. for m.d.; 20"x8' Monarch, q. c. g., 14"x6' Hendey yoke head.
Milling machines, 2B Hendey plain, arranged for m.d., electr. high speed head; No. 2A Becker vertical, m.d.
Sawing machine, No. 6 Cochrane-Bly, circular saw.
Turret lathe, No. 4 Bardons & Oliver.

West Penn Machinery Company **1210 House Building, Pittsburgh, Pa.**

Air compressors, 30 to 2500 cubic feet.
Baling press, 13-P Logeman, m.d.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutter, 1" Acme triple head, m.d.
Bolt cutters, 1½" 2" & 3" Acme, b. d.
Boring mill, 34" Colburn, turret hd., b. d.
Brake, 10'—10 ga., box & pan D. & K., m. d.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Crane, 5 ton alliance, 35' span.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Drill sharpener, Ing.-Rand "Leyner", 1½".
Drill, radial, 5' American, semi-univ., b.d.
Drills, upright 16" to 36".
Drill, No. 218 Baker, No. 5 M, T., b.d.
Engine, gas, 30 horse power Bessemer.
Gear tester, bevel 18" Gleason.
Generator, plating 6-v. 3500 amps.
Grinder, disc, 52" horizontal, Gardner.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 30"x76"
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, No. 2 Walker tool & cutter, b.d.
Grinder, No. 2 tool & cutter, Greenfield, b.d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Hammer, drop board, 500 lb. B. & S.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammer, 100 lb. Bradley cushioned helve.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b d.
Keyseater, No. 2 Baker, 2"x20", b. d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 7"x32" P&W, precision, m.d.
Lathe, 16"x12' Rahn-Larmon, geared head, t. a.
Lathe, 18"x8' Rockford, b. d.
Lathe, 18"x12' Hendey, geared head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d
Lathe, 26"x18" Pittburgh, d.b.g., t.a., b.d.
Lathe, Lo-Swing, 6"x60", a. p. d.
Lathe, roll, 42"x20' United, m.d.
Lathe, turret, 1" Dreses-Mueller, b. d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret, 2 spindle J&L., 2-7/8", m.d.
Lathe, turret No. 3-D Gisholt Simplimatic.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, plain, No. 2 Kempsmith, b. d.
Miller, universal, No. 2 Putnam, b. d.
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln, No. 12 P. & W. 32"x7½", b. d.
Miller, Lincoln, No. 5 Hendey, b.d.
Miller, vertical, Burke, table, 16x6, b. d.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibbler, L. & A., ¼", 36" throat, m.d.
Pipe mche., 2", 4", 6", 8" 12" & 16" Landis-Oster-Williams.
Planer, 30x30x10 Gray, 1 head, m.d.
Planer, 39"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Presses, horning, Nos. 38 & 38½ Bliss, b. d.
Press, s. s., No. 7 Am. Can, 3" stroke.
Press, arch, No. 30 Bliss, b.d.
Press, strip feed, No. 31-C McDonald, b.d.
Press, No. 59½ Toledo, 12" stroke.
Press, No. 19 Bliss o.b.i., b.d.
Presses, Stiles, type, 1½ and 3½ m. d.
Punch, EF Cleveland, 36" throat, 1½" thru 1".
Pump, 1500 lb. Triplex vert., 13 gal., b. d.
Riveters, air, hammer, spinning.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, guill, No. 2 H. & J., 2½" rd. b. d.
Shear, guill., 4"x4" Newbold, b.d.
Shear, up-cut, 22" Aetna, m. d.
Straightener, 84"x1" Bertch, m.d.
Slitter, gang, 36" Yoder, m. d.
Straightener, flat, 2½"x3/16" Shuster, m. d.
Testing machine, 400,000 lb. Riehle, b. d.
Tumbling barrel, 34"x45", belt drive.
Upsetters, 1" to 6".

USED AND REBUILT MACHINERY

FOR SALE BY

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Broach, No. 3 horiz., belt drive.
Grinder, New Yankee cutter & drill.
Grinder, Lumsden face grinder, m.d.
Hammer, 100 lb. Little Giant upright.
Lathe, 13"x6' South Bend, p.c.g.
Lathe, 20"x8' Flather, p.c.g.
Pipe mach., 2 spdl. Murchey, 2" cap.
Rivet spinner, No. 80 Grant, 5/16" cap.
Saw, hack 6"x6" Marvel, h.s.
Turret Lathe, No. 7 Foster, frict. hd.

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Blue print drying machine, 42" Paragon.
Bolt cutter, 1½" Landis, motor drive.
Flanging machine, No. 1½ McCabe.
Gear cutter, 36" Gould & Eberhardt.
Grinder, Norton plain cylindrical, 10"x36".
Grinder, No. 3 Brown & Sharpe univ. cutter & reamer.
Keyseater No. 1 Davis.
Lathes, 60"x24', new model Wright Fifield.
Lathes, Putnam speed, (3).
Lathe, 32"x12' Putnam.
Lathes, 30"x14' Davis.
Lathes, 29"x20' Schumacher Boye.
Lathe, 26"x10' Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26"—48"x18' McCabe, two spindle.
Lathes, 24"x32' N. B. P.
Lathes, 24"x10', Lodge & Shipley, turret on shears.
Lathes, 20"x12', Monarch with removable gap.
Lathes, 18"x8', Champion.
Lathe, 16"x8' Sidney.
Miller, No. 2 Shields, high power, single pulley.
Miller, 48" Newton continuous.
Press, No. 74½ Bliss, geared, straight side.
Press, No. 1 Bliss toggle.
Press, No. 1 V.&O. Inclinable 2" stroke.
Saw, Robertson hack saw, 6"x6".

D. H. Prutton Machinery & Tool Co.
5295 W. 130th Street, Cleveland, Ohio

Air compressor, 50 cu. ft., Allis Chalmers, m. d.
Bolt pointers (two), Economy 4"
Box printer, single color, Hall & Brown.
Broach, No. 2 Lapointe, 2 spindle.
Chucks, 23-6"x9" Heald magnetic.
Chuck, 1-12"x48" Heald magnetic.
Drill, 4 spindle Demco, b. b., p. f. single pulley drive.
Grinder, disc, No. 50 Gardner, m. d.
Grinder, disc, No. 50 Gardner, semi auto., with fixture for grinding edges of electric iron bottoms.
Grinder, disc, No. 14 Gardner.
Grinder, disc, No. 120 Gardner.
Grinder, disc, 22" Gardner, m. d.
Millers, (two), No. 12 B. & S.
Pipe threader, 4" Bignell Keeler.
Pipe threader, 2" Oster.
Planer, 36x36x10 Woodward & Powell 1 head on rail.
Plate, polisher, No. 27L Excelsior, m. d.
Press, No. 1 Bliss cam drawing, s. s.
Press, No. P2 Ferracute.
Press No. 65 Consolidated, s. s., flywheel type.
No. 0-36 Unishear, m. d., less motor
Manville four slide, hand feed, cap. ⅛x1.
Tappers, vertical (two), 5 spindle Webster & Perks.
Tapper, No. 2 Garvin.
Tappers (two), 5/8" Rickert Schafer.
Thread roller, 3/8 Waterbury.

FOR SALE BY

Factory & Mill Supply Co., Inc.
176 Federal St., - Boston, Mass.

Boring mill, Binsee horizontal, 3" bar.
Milling machine, No. 2-M Potter & Johnson, auto.
Planer, 48"x48"x12' Betts, 3 heads, m.d.
Radial drill, 6' American.

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Brake, 4'x3/16" Dreis & Krump, power leaf type.
Drill, 38" Rockford, b.g. & p.f., motor dr.
Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Keyseater, No. 2 Mitts & Merrill, b.d.
Lathe, 32"x26' Gleason, st. c. gear.
Lathe, 14"x6' LeBlond, q. c. g., taper attach.
Lathe, 42"x16' Bradford, triple geared.
Lathe, 18"x8' American, q. c. g.
Mill, No. 4 Cincinnati high power, plain, b.d.
Mill, No. 5-C Becker-Brainard, univ., b.d.
Mill, No. 6 Becker vertical, motor drive.
Mill, No. 2-Y Brown & Sharpe pl., arr. for m. dr.
Nibbler, No. 103 Gray, cap. 1/8" throat, 30".
Press, No. 90-D Toledo, dbl. crank, m.d.
Radial drill, 4' American, s.p.d.
Shaper, 16" Newark, b.g. crank, s.p.d.
Screw machine, No. 2 W. & S. brass lathe.
Screw machine, 1¼" model B Cleveland automatic.
Screw machine, 2" model A Cleveland automatic.
Turret lathe, 28" Gisholt, belt dr.
Turret lathe, No. 8 Bardons & Oliver, 3".

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Brake, press, L&N, 10', 10 ga.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3' & 4'.
Drills, radial, Drillmaster, new.
Forging machine, Ajax 2".
Gear cutters, No. 1 Whitons, (2).
Grinder, 12"x60" Modern.
Grinder, Walker 12" rotary.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Hobber, Adam No. 1, like new.
Lathes, 10x24, Logans, m.d., new in stock, (10).
Lathe, 10x24, Rockford Mfg. type, s.p.d.
Lathe, 18"x8' Amer. q. c. g.
Lathes, 20x8' LeBlond, q.c.g.
Lathes, 82" Niles locomotive wheel.
Miller, Briggs, type A Gooley Edlund.
Miller, Burr, 92" table.
Miller, No. 3 Knight vertical.
Pipe machines, 2"—4"—6"—8"—12".
Planer, Cincinnati 2 heads, m. d.
Planer, 36"x30"x8' Pond, 1 head.
Planer, 36"x36"x8' Gray, 2 heads.
Planer, 32"x32"x18' Gray, 2 heads.
Potter & Johnson 8A auto.
Press, 857 Toledo, rack & pinion 40" stroke.
Press, 55 Swaine.
Press, wheel, 400 ton 84" Niles.
Press, wheel, 200 ton 48" Niles.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Saw, 12x15 Racine.
Scrap baler Logeman hydraulic.
Shapers, 12"—16"—20"—24".
Large stock guaranteed electric motors. Any size.

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TAPS-TWIST DRILLS-FILES
CUTTERS-ENDMILLS-SAWS
HACK SAW BLADES

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619 W. Randolph St., Chicago, Illinois
SURPLUS BOUGHT AND SOLD

NEW INDEPENDENT LATHE CHUCKS
IMMEDIATE DELIVERY

		NET PRICE
18"—4 Jaw	Independent Chucks	$ 98.00
20"—4 Jaw	Independent Chucks	112.00
24"—4 Jaw	Independent Chucks	146.00
28"—4 Jaw	Independent Chucks	160.00
32"—4 Jaw	Independent Chucks	225.00
36"—4 Jaw	Independent Chucks	275.00

James W. George Machinery Co.
3146 E. Jefferson Ave., Detroit, Mich.

WANTED
SCREW MACHINES

Any Make or Model
In Any Condition

MODERN COLLET & MACHINE CO.
401 Salliotte St. Ecorse, Michigan

FOR SALE

Acme No. 55, 4 spindle, 1⅝ hole, collets, cams, fingers, bar feed—$1500.

Lodge & Shipley 14"x6' Q. C. Lathe, with 2 H.P. Lima Gear Shift Drive (new)—$750.

Potter & Johnson, prod. chucking lathe, power feed, bar feed, 1½" hole, oil pan, with Lima Gear Shift Drive (new)—$950.

Paterson Machine Tool Exchange
442 Main Street Paterson, N. J.

FOR SALE — GOOD TOOLS

Auto. Cleveland, ½" Model "A", B. D. ..... $750.
Auto. Cleveland, 2½" Model "A", B. D. ..... $3000.
Auto. Gridley, 7/8" Model F, 4 Spindle, M.D. ..... $2000.
Drill, Automatic, Sensitive, with motor, hi. spd., cap., 3/16" ..... $150.
Drill, 2 spd. Allen H. S. B. B. 14" Swing, No. 2 M. T. ..... $300.
Drill, Foote Burt No. 24, 24" Heavy Duty ..... $1000.
Drill, 2 spd., Colburn, No. 2 Mfg., Motor Driven ..... $2150.
Radial Drill, 2' Fosdick, M.D. 220/60/3 ..... $750.
Gear Cutter, No. 6 B. & S., Cap. 80"x11" ..... $3500.
Grinder, Landis, 12"x36 with Motors ..... $4000.
Grinder, 12"x24" Plain B.D. No Name. $250.
Grinder, 16"x96" Safety, M.D. 26" Wheel ..... $4500.
Lathe, 12"x5' Hendey, Q.C., Taper. $1500.
Lathe, 14x6 Carrol Jamieson, Q. C... $600.
Lathe, Monarch, 14"x10' QC with 4 jaw chuck ..... $1150.
Lathe, 16-18"x11' Lehman, Q.C. Taper ..... $1750.
Lathe, 18-20"x12' L. & S., Q.C. M. D. ..... $2250.
Planer, 36"x36"x12' Woodward-Powel, 2 Heads, with Motor ..... $2500.
Press, No. 126 Max Ams O.B.I. 1" str. $325.
Saw, No. 8 Marvel, Band, M.D..... $800.
Shaper, 16" Amer., B.G., B.D., ... $1000.
Turret Lathe, 2x24 J & L, Geared Head and Feeds ..... $1150.
Turret Lathe, 2-½"x26" P & W for chuck or bar work ..... $2150.
Miller, No. 2, Craftsman Rotary $750

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3911 West Madison Street, Chicago
Kedzie 0212

WE BUY **WE SELL**

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REEVES DRIVES

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All Ratios Up to 200 Horsepower
ALL DRIVES OVERHAULED
IMMEDIATE DELIVERY

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SELLING FOR CUSTOMER

CAN BE SEEN IN OPERATION

Grinder, No. 2 Oakley, Cutter and Tool Motor Drive, Hand Feed .....**$850.**
Boring Mill, 8' Niles, Variable Speed AC. Motor Drive .....**$17250.**
Grinder, No. 2 Landis Univ., 12"x32" B. D. .....**$2500.**
Grinder, Brown & Sharpe, No. 12, 8x36, belt drive .....**$2000.**
Grinder, Landis 16x66, crankshaft, belt and motor drive, serial 21513.**$3000.**
Grinder, Heald No. 65, cylinder with small spindle for internal grinding, motor driven, serial 586 .....**$1500.**
Lathe, Willard 13x6, SQC with chuck, belt drive .....**$425.**
Lathe, Hendey 19x8, QC with taper attachment .....**$1800.**
Lathe, Monarch, 20x8, QC, 14" chuck **$2000**
Lathe, Lodge & Shipley, 22x14, patent head, QC, DC motor drive.....**$1500.**
Lathe, Draper 20x12, plain change, taper attachment .....**$350.**
Planer, Whitcomb 18x5, 1 head, arranged motor drive .....**$450.**
Miller, No. 2 Cincinnati Geared Head Full Universal with slotting attachment.**$6450.**
Honing Machine, Hutto, 8' radial arm, motor drive .....**$2000.**
Press, Hydraulic, Hannifin, 20 ton arbor, C frame, motor drive complete....**$450.**
Drill, New Albany Tool Room, friction type ½" cap. .....**$100.**

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in A1 Condition

1—No. 2 Brown & Sharpe Universal Milling Machine
1—42"x42"x12' Cincinnati Planer, 3 Heads
1—3' Canedy-Otto Radial Drill, M.D. on Spindle
1—20"x14' Lehmann Engine Lathe, qu. ch. g.; d.b.g.

H. H. PELZ MACHINERY
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Under Writers Fire Pump
18-10-12-1000 gal. per minute. Steam driven.
Made by Buffalo Steam Pump Co.

MORRIS MACHINERY CO.
Newark, N. J.

1—52A Waterbury Farrel Foundry Press
1—16"—28"x8' American Gap Lathe Comp Rest
2—No. 506 Defiance Gun Stock Shaping Machines
1—Theil Filing Machine
4—3-⅛" Cleveland S.S. Automatics, Chuck.
1—No. 1 W.F.F.—S.S.S.D. Header
1—30" Norton Lapping Machine, M.D.
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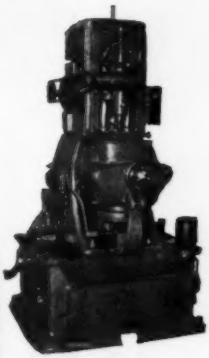

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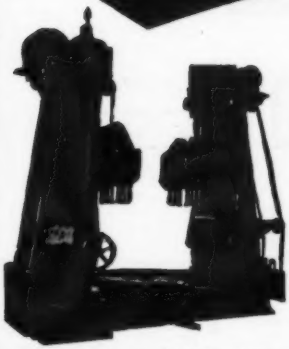

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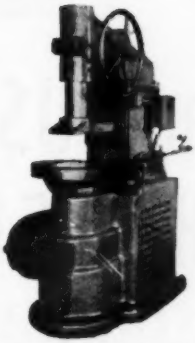

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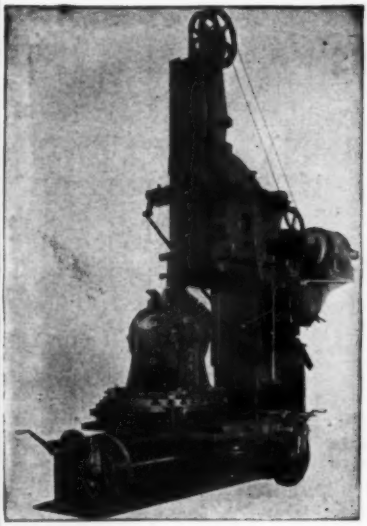

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48" N-B-P; M.D., 50" rotary table

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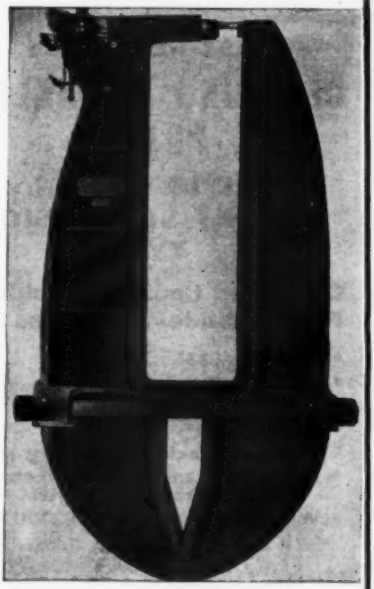

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6-ft. American Triple Purpose; M.D.
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- **Bed 84"x133"**
- **All Steel Construction**
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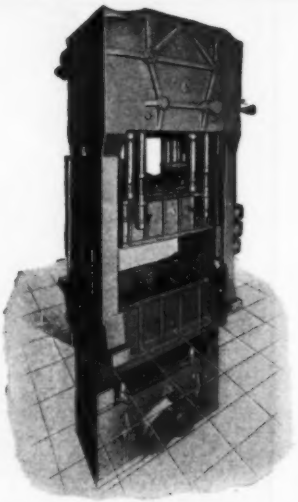

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24" Gisholt Univ.; 28" Pond; 24" Steinle
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30' Pit; 156" face plate; 52"x22' Fifield
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36" and 51" Bullard, 2 heads

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36"x36"x10' American; 36"x8' Hamilton
26"x8' Cleveland Openside

20' ALLIANCE POWER BENDING ROLL, Top Roll 18½", Lower Rolls 18" Ea. Cap. From 1" to 1½"; Drop End Housing; M.D.

ROLLS—POWER BENDING

12' Wickes 1¼" cap.; M.D.; 10' Wickes Vert.; 10' Pyr. type, 12" top roll, 9" bottom roll; 10' Columbus ¾" cap.; 10' 3/16" Niagara; 6x6x½" Vertical Angle Roll

ROLLER DIE MACHINES

2, 3, 4, 5, 6, 7, & 8 spindle Yoder & McKinney

ROLLER LEVELLERS

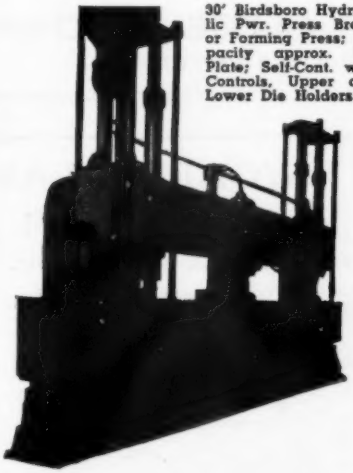
No. 3 Hilles & Jones Plate Straightening Roll; 8'x11"; 6 rolls; Dia. rolls approx. 11"
30", 50", 54", 56", 60", 66" H & J, McKay, Heinss

PRESSES—DOUBLE CRANK

No. 97-H Toledo, dble. gd. Tie rod constr., 10" stroke, Max. Pressure approx. 600 tons, Est. wgt. 245,000 lbs.
No. 158-B Cleveland Straight Side; Tie rod, 5" stroke, 72½" bet. housings; 10" shaft
No. 6010¼ Hamilton Straight Side; Tie Rod; 8" Str., bed 60x51", friction clutch
No. 23-J Bliss, 6" str., 4" shaft, 103" bet.
No. 206-F Toledo, gap frame, bed 102"
Nos. 4¾ Bliss; No. 1D Bliss, 4" stroke
No. 93-B Toledo Straight Side; B. G., 42½" bet. housings, 5" shaft; 5" stroke

PRESS BRAKES

OHL: 10'10 ga.; 10'14 ga.; 6' 7/32"; 5' 14 ga.;
CHICAGO STEEL: 54" 10 ga. Nos. 255 & 335



30' Birdsboro Hydraulic Pwr. Press Brake or Forming Press; capacity approx. ⅝" Plate; Self-Cont. with Controls, Upper and Lower Die Holders

Machinery Co., Inc.

449 W. PERSHING RD., CHICAGO, ILL.

BEST VALUES ON THE GLOBE

28"x21' Chard quick lathe—Taper attachment
36"x26' New Haven Heavy Duty Lathe
42"x17'5" Bement Miles Lathe, Geared face plate
44"x16' Lodge & Shipley quick change lathe, geared face plate, power feed to compound slide
26"x16'6" Bullard Heavy Duty Lathe, geared chuck, taper attachment
6' Radial Drill arranged for Motor Drive
4' Universal Radial Drill
6" Bar Pedrick Horizontal Floor type boring Mill, Motor Driven
24"x10' American Quick Change, Geared Head, Single Pulley Drive Lathe
18"x8' Prentice Quick Change Geared Head, Single Pulley Drive Lathe, Pan bed
25" Milwaukee Heavy Duty, double back geared shaper, V ram type arranged for Motor Drive
24"Gould & Eberhardt Heavy Duty, Back Geared shaper, V Ram type
No. 3 Cincinnati Universal Double Back Geared positive feeds milling machine, Motor driven
No. 55 Hendley and Whittemore Punch and Shear arranged for Motor Drive

GLOBE MACHINERY COMPANY

214 CENTRE STREET **NEW YORK, N. Y.**

WORLD'S LARGEST STOCK POWER PRESSES

No. 152D Cleveland, double crank, 76", crank 4"
No. 204A Toledo, double crank, gap
No. 165 Consolidated, double crank, 36"
No. 4 United Eng. & Fdry., 4 crank, 156" between uprights, 8" dia. crank 7¼" stroke, weight 118,000 lbs.
No. 6B Niagara, dbl. crank 36", crank 3½"
No. 5126 Ferracute, dbl. crank 124", crank 7½"—9"
No. 106 Bliss gap, double crank, geared
Nos. 92B, 91B & 91C Toledo, double crank
No. 506 Bliss, geared, straight side, tie rod
No. 59½ Toledo, tie rod
No. 59 Toledo
No. 56A Toledo
No. 55 Consolidated
Nos. 74½, Bliss straight side,
No. 407-54 Bliss, toggle, double crank, t.r.
No. 14B Bliss, tie rod, toggle
No. 168¾ Toledo, tie rod, toggle
No. 3¾B Bliss toggle
Nos. 1½, 3½B, 3½C Bliss toggle presses
No. PA3 Ferracute horning
75 ton EG51 & ES1 Ferracute, knuckle joint
600 ton American Can, knuckle joint
150 ton EG52 Ferracute, knuckle joint
No. 9C Badger State combination punch & shear
No. 6 Hilles & Jones multiple punch
Punches & shears, single & double end
Squaring shears, various sizes
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here

Rebuilt and Guaranteed.

JOSEPH HYMAN & SONS

TIOGA AND ALMOND STS., **PHILADELPHIA, PA.**

Good Used Machinery

BORING MILLS—Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3¼" Bar; Colburn 42" Vert. 2 Hds.; Colburn 42" one head; Mach. Tool 3" Horiz.; Bullard 28" 1-Hd. Vert.

BRAKES—Keene 10' 16 ga. Toggle Press

COLD SAWS—Newton 9" cap., Cochrane & Bly Nos. 2-B & 4-B; Higley No. 14

CUT-OFF MACHINE—Davis 6" cap.

DRILLS (RADIAL)—Fosdick 4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Bickford 6' gr. box; Mueller 4½' g. box; Morris 3' Gr. Box; American 5'

DRILLS (H. S. B. D.)—H & W 2, 4, 5sp.; Sipp 1 & 2 sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Gif. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Defiance Hvy Duty 2" cap.; Hamilton 42" S. H.; Barnes 20" & 24" 1-sp. & 20" 4-sp.; P W No. 12 Multi-Sp.; Natco 20 sp. Rect. head; P. & W. 24 sp. rectangular head Adj.; Barnes 4-Sp. 24" Camelback; Moline 4-Sp. Hole Hog; Colburn 20" S.P.D.

GEAR CUTTERS—B & S 26" s. p. d. automatic spur; Cincinnati 36" gear cutter. B. & S. 48"x10"; G. & E. 48' gear Cutter; Fellows 36" Gear Shaper

GRINDERS—P & W 12" vert. surf.; Cin. No. 2 & B. & S. No. 12 univ. tool, B & S No. 16 pl.; B & S No. 2 Surf.; Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; Badger No. 220, auto. d. e., opposed disc (4); Diamond No. 2 Auto. Surf.; Landis No. 3 Univ.; Cinc. 12x36" pl.; Ohio No. 3 Univ.; Bath Univ. W & M No. 2 Surf.; Heald No. 75 Int.

HAMMERS—Mayer 50-lb.; W & W 165 lb.; Kane & Roach 70 lb.; Beaudry 150 lb.; Bradley 200 lb. Upright Helve

KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x9'; American 34"x18' Q.C.G. M.D. Hvy.; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. g; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12"; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 16"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'. L. & S. 16"x8' M.D.; S. Bend 16"x8'

MILLING MACHINES—Ohio No. 29, Univ. Ohio No. 20, Hendey No. 3, B & S No. 3, LeBlond No. 3H, Cin. No. 1 s.p.d. Plain; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table: Becker No. 2 Vert.; Ohio No. 24 Plain; Rockford No. 0 Plain; Becker No. 4 Vert.; B & S No. 12 Mfg. Type; Becker No. 5 Plain; Becker 7-H Mfg.

THREAD MILLERS—Smalley General No. 23-A; Moline No. 10

PLANERS—Pond 32"x34"x10'; Sellers 36x 36x12'; Pease 26"x26"x9'; Cincinnati 36" x36"x10' 2 Hds.

PIPE MACH.—Williams 6" cap.; Oster 6"

PUNCH PRESSES — Ferracute No. P-4; Barouth No. 3 & No. 4 O.B.I.; Bliss No. 62; Toledo No. 31 & No. 32; Fer. No. EGF 52 Coining; Swaine No. 38 arch; Cons. No. 24 Blanking; Walsh No. 3 O.B.I.; Bliss No. 19½ O.B.I.; Bliss No. 21

SAWS (HACK)—Atkins 8x8"; Racine 6x6"

SHAPERS—S & M, G & E, Ohio, Mi., Q. City, Davis, Ohio & G & E 20"; S & M, Q. City, Rock., Cin. 24"; Ohio 26"; Cin. 24" s. p. gr. box; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox; Amer. 20"; Rockf. 24" gearbx.; Stockbridge 28"

SCREW MACHINES—8 Hand; Gridley 4-sp. ¾"; Natl. Acme No. 52

SQUARE SHEAR—Ohl 8' 14-ga.

SLOTTER—Barr 12"; Betts 6" stroke; Niles 12"

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Baush 30" M.D. Vert.; Potter & Johnston, 8½x16 No. 10; Libby 24", m.d.; P. & W. 2¼" hole grd. hd.; Greenlee 2¼x26; Brown & Sharpe No. 4; Gisholt 26"; Colburn 30" Vert.

Above is only a small part of our large stock on hand

McDonald MACHINERY CO.
1531-35 N. Broadway ST. LOUIS, MO.

EMCO REBUILT

AUTOMATICS

⅜-½" Cleveland Model B, m.d. (2)
4 spindle ⅞" Cleveland Model M, m.d. (2)
⅞" Model A Cleveland, belt
1¼"; ½" Cleveland Model B, belt
1¼" Hartford, belt
2½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
No. 5A Potter & Johnston Automatics (7)
No. 6A Potter & Johnston (3)
No. 6D Potter & Johnston for brake drum work
No. 23, 24 New Britains, belt

ARBOR PRESSES

No. 24 Greenerd, m.d.
15 ton Lucas, belt
No. 3 Famco, bench type

BOLT THREADING MACHINES

9/16" Landis 2 spindle, m.d.
2 spindle 1" Acme, belt
3 spindle 1" Acme, belt
1" Landis, belt
1½" Landis, 2 spindle, m.d.
1½" Landis, belt, lead screw
2½" Acme, belt
American Bolt Heading Machine, belt, 1¼" cap.
No. 11S Rickert & Shafer Automatic Threading, 1" cap. m.d.

BORING MILLS

30" Colburn, 1 head, belt
48" Niles-Bement-Pond Car Wheel Borer, belt
51" Baush, m.d., 2 heads
7' Niles, 2 heads, friction feeds, old
No. 2 Barrett Cylinder Borer, 5" bar, belt
Niles-Bement-Pond Cylinder Borer, m.d., 12" main bar

BROACHING MACHINES

Cincinnati Mill Broach, m.d., brand new
No. 2 J. N. LaPointe, m.d., gear box
No. 2 LaPointe of Hudson, belt
No. 3B J. N. LaPointe, gear box, m.d.
No. 3 J. N. LaPointe Double, belt

CENTERING MACHINES

Hendey Single End, 14½" swing
Whiton Single End, 12" swing
Phoenix Single End

BALL BEARING DRILLS—SINGLE SPINDLE

Allen No. 2, belt
Henry & Wright Class B No. 2, belt
Henry & Wright Class K, No. 2, belt
Leland & Gifford No. 2, belt

BALL BEARING DRILLS, MULTIPLE SPINDLE

2 spindle Edlund No. 3, m.d.
2 spindle Henry & Wright No. 2, belt
2 spindle Leland & Gifford No. 2, belt
2 spindle Textile Horizontal, m.d.
3 spindle Avey, m.d.
3 spindle Cinc. Pulley Mchin. No. 2, belt
3 spindle Demco, power feed, No. 2
3 spindle Edlund No. 2, m.d.
3 spindle Henry & Wright class K No. 2
4 spindle Allen Class B No. 2
4 spindle No. 2 Fosdick, power feed
4 spindle Gardam No. 1
4 spindle Henry & Wright Class B No. 2
4 spindle Henry & Wright Class K No. 2
4 spindle Kokomo No. 2
4 spindle Leland & Gifford No. 2 m.d.

MULTIPLE SPINDLE DRILLS

3 spindle 20" Barnes Gang
4 spindle No. 2 Colburn Mfg.
4 spindle No. 3 Foote-Burte
4 spindle No. 2 Foote-Burte Rail
4 spindle No. 4 Foote-Burte Rail
5 spindle 24" Barnes All Geared Self-Oil.
6 spindle 21" Hoefer
6 spindle National Acme Auto. Horizontal
6 spindle Niles
No. 00S, 1SS Garvin Horizontal Duplex
No. 1 Pratt & Whitney 2 spdl. Gun Barrel
D2 Fox Straight Line
No. 2, 3 Bausch
No. 5 Fox
No. 30, 37 Natco
No. 7D Moline 2 spindle Hole Hog
No. 15HC Fox
No. 18 Natco
No. 25 Baush Straight Line
No. 26C Fox Tapper No. 51C Harrington
D31 Fox

RADIAL DRILLS

2½' Avey Sensitive
3' American Sensitive
3' Carlton Sensitive
3' Mueller Plain, gear box
4' Cincinnati Bickford Plain, U.S. Varidrive
4' Hammond Jack Knife, m.d.
4' Hammond Jack Knife Wall Type
4', 5', 6' Niles-Bement-Pond Semi-Universal, var. speed m.d.
4', 5', 6' Niles-Bement-Pond Semi-Universal, gear box
4' Ryerson Plain, gear box
4' Prentice Plain, cone
5' Dreses Plain, gear box
5' Prentice Plain, cone
6' Dreses Plain, gear box
7' Dreses Plain, gear box
7' Fosdick Plain, cone
No. 1 W. F. & John Barnes Horizontal

UPRIGHT DRILLS

15", 22", 26", 28" W. F. & John Barnes
20" Barnes All Geared Self-Oiling
20" Canedy-Otto, m.d.
20" Superior
21", 24", 32", 36" Aurora
21", 25" Weigel
22", 24" Barnes All Geared Self-Oiling
23" Snyder
24" Hoefer
24" Rockford
25" Superior
32", 36" Cincinnati Bickford
32", 40" Prentice
No. 2, 22 Colburn Mfg. Type
D2 Colburn H.D.

THE EASTERN

1001 TENNESSEE AVENUE,

MACHINE TOOLS

D3 Minster H.D.
No. 314, 315 Baker Bros. H.D.

GEAR MACHINERY

6", 18' Gleason Straight Bevel
16" Cincinnati Hobber
No. 1-26" Whiton Full Universal
No. 3-26", 3-36", 3 Heavy, 4-36", 4-43", 6-60", 6-72" Brown & Sharpe Spur Gear Cutters
No. 3-26" Cincinnati Spur Gear Cutter
No. 5A Lees-Bradner Gear Generator
No. 61 Fellows Gear Shaper
Gleason Bevel Gear Tester
Schuchardt & Schutte Gear Tooth Rounder
24" Cross Gear Tooth Rounder
20" Rochester Gear Tooth Rounder
Gleason Spiral Bevel Gear Rougher

INTERNAL GRINDERS

No. 6 Bryant Chucking, belt
No. 9 Cincinnati Internal, s.p.d.
No. 12A Bryant, two motor drive
No. 80 Heald, 2 motor drive
No. 50 Heald Cylinder, hydraulic
No. 55, 60, 65 Heald Cylinder

CYLINDRICAL GRINDERS

6x18" Cincinnati Plain Hydraulic, m.d.
6x32" Norton Plain, m.d.
10x18" No. 14 Brown & Sharpe, belt
10x18" No. 14 Brown & Sharpe, m.d.
10x24" Landis, md.
10x30" Queen City, m.d.
10x36" Landis Integral Cam, m.d.
10x36" Norton, m.d. (6 in stock)
10x36" Norton, belt
10x50" Norton, m.d.
10x52" Landis, m.d.
12x18" Cincinnati Plunge Cut, m.d.
12x36" Cincinnati, m.d.
12x36" Cincinnati, belt
12x36" Modern, m.d.
12x42" Landis, belt
12x48" Modern, m.d.
12x72" Cincinnati, 3 m.d., hydraulic
16x52" Landis, m.d.
18x72" Cincinnati Auto Parts Grinder, m.d.

DISC GRINDERS

No. 4 Besley, s.p.d.
No. 4 Gardner, s.p.d.
No. 6 Diamond, s.p.d.
No. 20 Gardner, B.B. Combination Disc & Roll, m. d .
No. 120 Gardner Plain, s.p.d.
No. 120 Gardner Combination, s.p.d.

EMERY GRINDERS

0" Blount Wet, m.d.
Cadillac Polishing, m.d.
Hill-Curtis Polishing, belt
Hisey-Wolf 5 H.P., m.d.
Safety Emery Wheel Co., belt
Mitchell Eng. Co. Type A1 Polishing, m.d. H.P. Northern, m.d.
Rockford Wet, belt
Springfield Wet, m.d.
U. S. Elec. Tool Co., m.d.

CENTERLESS GRINDER

Cincinnati Valve Seat Grinder, motor drive, 2 motors

SURFACE GRINDERS

No. Fraser Lapper, belt
No. 3 Brown & Sharpe Planer Type Surface, belt
18x48" Diamond L.D. Face, m.d.
30"x84" Diamond HD. Face, m.d.
54" Bridgeport Knife, belt
Covell-Hanchett Knife, m.d. No. 500 UK

TOOL & CUTTER GRINDERS

No. 1 Cincinnati, belt
No. 3 Brown & Sharpe, belt
No. 4, 5, 31 Oliver Motor Driven Drill Pointers
No. 23 Brown & Sharpe Gear Cutter Grinder, belt
Gisholt Universal, belt
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter, belt
Landis Chaser, belt
Yankee Drill, belt

UNIVERSAL GRINDERS

12x48" Modern, belt
No. 4 Brown & Sharpe, belt

HAMMERS

Pettengell Bumping, belt
60 lb. Bradley Rubber Cushioned Helve, belt
80 lb. Bradley Rubber Cushioned Helve, belt
100 lb. Little Giant, belt
100 lb. Little Giant, m.d.
200 lb. Bradley Upright Strap, belt
250 lb. Little Giant, belt
350 lb. Niles Steam, new (3)
350 lb. Bement-Miles Steam
650 lb. American Eng. Wks. Steam
1500 lb. Morgan Single Frame Steam
2000 lb. Erie Double Frame Steam
2000 lb. Niles-Bement-Pond Single Frame Steam

KEYSEATERS

1" Morton, belt

GEARED HEAD ENGINE LATHES

16"x7' Cisco, m.d.
20"x14' Hendey, m.d., taper
22"x16' centers (22' bed) American 100 H. P. Super Lathe
24"x8'6" Bridgeford, m.d.
24"x18' Lodge & Shipley Patent Head, m. d., taper
26"x16' Bradford, m.d.
26"x16' Bridgeford, m.d., taper
26"x18' Bridgeford, m.d., taper
27"x21'9" Bridgeford, m.d., taper

CONE HEAD ENGINE LATHES

11"x5' South Bend
13"x6' Willard
14"x6' American
14"x6' Bradford

Continued on next Page——→

MACHINERY CO.,
CINCINNATI, OHIO

Continued from preceding page

CONE HEAD ENGINE LATHES (Cont'd)

15"x6' Willard
16"x6' Bradford
16"x6' Pratt & Whitney
16"x8' Bradford
16"x8' Greaves-Klusman
16"x10' Bradford
16"x10' Bradford
18"x6' Bradford
18"x8' Bradford
18'x8' Lodge & Shipley
18"x8' Mueller, taper
18"x10' Bradford
18" raised to 28"x10' Reed
18"x10' Springfield
18"x12' Barker
18"x12' Monarch
18"x12' Schumacher-Boye
18"x14' LeBlond, taper
19"x8' LeBlond, taper
19"x12' LeBlond, taper
20"x10' Davis
20"x10' Lodge & Shipley
20"x10' Pond
21"x8' LeBlond, taper
21"x10' LeBlond, taper
21"x12' Bradford
21"x16' LeBlond, taper
22"x12' Greaves-Klusman
22"x13' Niles
22"x18' Niles, taper
24"x10' Bridgeford
24"x10' Canada
24"x10' LeBlond
24"x10' Whitcomb-Blaisdell taper
24"x11' Chard
24-48"x16' McCabe 2 in 1
24'x16' Schumacher-Boye
26"x18' Schumacher-Boye, taper
30"x14' Hamilton, taper
30"x16' Schumacher-Boye
30"x20' Schumacher-Boye, taper

MANUFACTURING LATHES

3x80" LoSwing, m.d.
6x36" LoSwing, m.d.
8x60" LoSwing, m.d., hardened ways (2)
8x60" LoSwing, m.d., hardened ways, 2 carriages
12"x5' Sebastian, m.d.
16"x6' Rockford, cone
18"x8' Chard, cone
20"x8' American Turret, cone
20" raised to 28"x10' American Plain Turning, cone
30" American Pulley Turning, cone
11"x4' WellsSpeed Lathe, cone
15"x6' Automatic Threading, cone
Niles-Bement-Pond Axle, cone
No. 5—42x96" Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d., brand new
Niles-Bement-Pond Quartering Machine, m.d., new

MILLING MACHINES

No. 0 Steptoe Plain, cone
No. 25 Becker Plain, cone
No. 2 Pratt & Whitney Hand, cone
Carter & Hakes Mfg., belt
No. 2 Garvin-Lincoln Type, belt
Gooley & Edlund Briggs Type A, belt
Putnam Briggs Type, belt
Newton C17 Vertical Slab, m.d.
11"x4' Hanson-Whitney, m.d.
30"x28"x8' Ingersoll Planer Type, m.d.
40" Ohio Tilted Rotary, m.d.
48" Oesterlein Tilted Offset, m.d.
C66A Newton 3 spindle Continuous, s.p.d.

MILLING MACHINE ATTACHMENTS

Vertical Attachment for No. 3 Cincinnati, cone
Vertical Attach. for Milwaukee Mfg. Type
Vertical Attach. for No. 1½ Cincinnati cone
Heavy Vertical attach. for No. 2 Cincinnati cone
Porter-Cable Vertical Attach.
12½" Brown & Sharpe Plain Dividing HD.
No. 6 Brown & Sharpe Triple Index Centers
12" Cincinnati Gear Cutting Attach.
16" Cincinnati Gear Cutting Attach.
Slotting Attachment for No. 2b Milwaukee
Universal Attachment for No. 2A Brown & Sharpe
1¼" Cincinnati Rack Milling Attach. for No. 3 dial type
Kearney & Trecker Attachment for milling bridge reamers
Cincinnati Spiral Milling Attach. for No. 3 cone type
Kearney & Trecker Universal Attach. for No. 3B
Slotting Attach. for No. 3 Cincinnati H.P.
Slotting Attach. for No. 2 Cincinnati cone
Universal Attach. for No. 3B Milwaukee

PIPE MACHINES

2" Landis Double Head Pipe & Nipple, cone
Red-E-Haul Portable, m.d., 2"
2" Bignall & Keeler, m.d.
2" No. 70 Jarecki, m.d.
2" Merrell, m.d.
4" Bignall & Keeler, m.d.
4" Eaton, Cole & Burnham, cone
6" Bignall & Keeler, cone
8" Landis, m.d.
12" Landis, m.d. (2 in stock)

PLANERS

24"x24"x12' Chandler, 2 heads, belt
36"x36"x10' Cincinnati, 3 heads, belt
36"x36"x10' Whitcomb-Blaisdell, 2 heads, belt
36"x36"x13' Niles-Bement-Pond, 1 rail, 1 side head, belt
42"x42"x12' Niles-Bement-Pond, 2 heads, m.d., box table
42"x42"x18' Cincinnati, 2 heads, m.d.

PRESSES

McDonald Single Crank, 4" stroke
Waterbury-Farrel S.C. O.B. 1-¾" stroke, weight 600 lbs.
Waterbury-Farrel D.C. O.B. 1½" stroke, wt. 1700 lbs.

ALL MACHINES LISTED IN OUR STOCK

THE EASTERN

1001 TENNESSEE AVENUE,

No. 2S Consolidated O.B.I.
C2 Ferracute O.B.I.
D2 Ferracute Single Action Drawing
DD2 Ferracute Double Action Drawing
P2 Ferracute Stiles Type
No. 6 Waterbury-Farrel D.C.
S51 Ferracute D.C.
DG53 Ferracute Redrawing
No. 268¼B Toledo D.C. Toggle Drawing, 29" stroke, weight 175,000 lbs.
No. 496D Toledo D.C. Toggle Drawing, 17" stroke, weight 160,000 lbs.
30 ton Lourie Hydraulic
B33 Metalwood Hydro Pneumatic
No. 0 Springfield Straightening

PUNCHES & SHEARS

Buffalo Armor Plate Slitting size 101Wx20
Cleveland Model EF S.E.
No. 6 Long & Allstatter D.E.
No. 6 Long & Allstatter S.E.

RIVETERS

No. 2A, 2A H.D., 3A HighSpeed Hammer Co.
¼" Shuster
Hanna Air Riveter, 13" throat
Chicago Pneumatic 10x25x97
Hanna Bench Type Air, 6" throat

SAWS

No. 2B Cochran-Bly Cold Saw
No. 4 Cochran-Bly Cold Saw
No. 4B Cochran-Bly Cold Saw
No. 15 Lea-Simplex Cold Saw
6" Avey Milband Cutting-off Saw
6x6" Peerless Hack Saw. m.d.
6x6" Racine Hack Saw
10x16" Kelley Hack Saw, m.d., new (5 in stock)
8x8" Atkins Kwik-Kut Hack Saw, m.d.
8" Newton Cold Saw
Burr Cold Saw
Knowlton Cold Saw
20" Burke Cold Saw

TURRET LATHES AND SCREW MACHINES

No. 0 Brown & Sharpe Hand, cone
No. 4 Bardons & Oliver, cone
No. 4 Foster, cone
No. 6 Brown & Sharpe, cone
2¼" Acme Flat Turret, cone
2¼x24" Jones & Lamson Steel Head Flat Turret, m.d., bar
2¼x24" Jones & Lamson, bar feed, m.d., geared head (4)
3x36" Jones & Lamson Geared Head, chucking (4)
3x36" Jones & Lamson Geared Head, bar
3x36" Jones & Lamson 2 spindle Geared Head, chucking (6)
3¼x40" Greenlee Flat Turret. cone, bar
18" Acme Turret, cone
21" Gisholt Model H Tilted Turret (3)
24" Gisholt Model I Tilted Turret (3)
26" Libby Type C Turret Geared Head, m.d.

SHAPERS

16" Hendey Friction Type
24" Queen City Back Geared, cone
24" Smith & Mills Friction Type

CIRCLE SHEARS

Niagara 13" throat, belt, 16 ga.
Southwark Rotary, 36" throat, ¾" cap. m.d.
No. 2 Southwark Rotary, 30" throat, ⅝" cap., m.d.
No. 34 Lennox Rotary Bevel, ¾" cap., belt
No. 25S 2x14 Quickwork Rotary, 30" throat, ¼" cap., m.d.
Quickwork Circle, 30" throat, 16 ga.
Quickwork 20" throat, 18 ga., belt

SHEET METAL MACHINERY

7' Cast Iron Hand Brake, 18 ga.
McCabe Pneumatic Flanger, ½" plate
Niles-Bement-Pond Flanger, 8'—1¼" cap.
10' Niles-Bement-Pond Flanger, 1¼" cap.
No. 1 Campbell Nibbler, 6" throat, 3/16" cap.
No. 2 Campbell Nibbler, 12" throat, ⅜" cap.
No. 10A Quickwork Seamer, 20" throat, new
Magee Sheet Metal Wiring & Edging Machine, m.d.

SLOTTERS

84" Newton, m.d.

TAPPING MACHINES

No. 1 Garvin Knee Type, belt
No. 2, 2X Garvin Automatic
Gaterman Oscillating Pneumatic, ¾" cap. (3)
½" Rickert & Shaffer Vertical (2)
No. 5 Webster & Perks 5 spindle Vertical Nut, belt
6 spindle 1" Acme Semi-Auto. Nut, belt

WELDERS

200 ampere Lincoln Stable Arc
300 ampere General Electric
300 ampere Lincoln Stable Arc
Hobart Bros. 300 amp., gasoline engine drive

MISCELLANEOUS

Norton Running Balance Indicating Machine, m.d., 66" cap.
No. 5 Williams & White Bulldozer, belt
16" Heald Rotary Magnetic Chuck
Matson Cut-off Machine, s.p.d.
Walker Demagnetizer
Sprague Elec. Wks. Dynamometer, 250 H. P., 1500 RPM, 570 amp. 250 volts, complete with control equip.
No. 22 Williams & White Eye Bender, m.d.
12 H. P. Hercules Gasoline Engine
No. 2 Cochran-Bly Filing Machine
Gas Furnace 60x26½x20" inside cap.
No. 1 Fischer Oil Groover
Springfield Oil Separator, 1 peck size
Blevney Polishing Machine
Production Polishing Machine Type A
No. 11 Cochran-Bly Saw Sharpener, m.d.
No. 11S Cochran-Bly Saw Sharpener, m.d.
No. 1 Leighton Type Straightening Machine, m.d., ¼" to 1" dia. capacity with minimum length of 2-¾". Brand new. 2 in stock
¼" Shuster Wire Straightener, m.d. 8' max length (2)
¾" Shuster, belt, 6' length
Motors—all sizes—A.C. and D.C.—200 in stock

SEND US YOUR INQUIRIES.

MACHINERY CO.,

CINCINNATI, OHIO

"The World is Our Field"

BORING MILLS
3-¾" Bar Bement Knee Type
60" Bullard Vertical
5" bar Niles, Floor Type

RADIALS
4' Bickford, plain
4' Morris, gear box
5' Western, low hung
6' Baush, ex. heavy

GEAR CUTTERS
24"x8" B&S, spur
24"x9" G&E, spur
36"x10" B&S, spur
60"x12" B&S, spur
64"x20" G&E, spur
50"x8" G&E, spur & bevel
60"x16" G&E, spur & bevel
90" P&W, spur & worm
24" Adams Hobbers
5A Lees-Bradner Generator
6"& 16" Bilgrim Generators

LATHES
19/36"x10' LeBlond Gap
21"x10' LeBlond Q.C.G.
24"x10' L&S Q.C.G.
30"x12' L&S Selective Head
30"x15' L&S Q.C.G.
36"x20' Pond, cone
42"x17' Pond, cone
48"x16' Bement, cone
60"x24' Wright, cone
32"x21' NBP turning, D.C.

RAILROAD SHOP TOOLS
48" Putnam Car Wheel Boring
52" Betts Car Wheel Boring
No. 2 NBP Axle Lathe
No. 4 Putnam Axle Lathe
No. 3 NBP Axle Lathe
Bridgeford Journal Truing
42" NBP Wheel Lathe
42" Putnam Wheel Lathe
48" NBP Wheel Lathe
85" Putnam Wheel Lathe
Newton Axle Keyseat Mill

SIMMONS MACHINE TOOL CORP.
1725 Broadway, Albany, N. Y. Singer Bldg., New York City

OTT MACHINERY SPECIALS

AUTOMATICS:
Brown & Sharpe, No. 0 & 00
Cleveland, Model M, 4½" Chucker, M.D.
Cleveland, Model B, 1¼, 2 & 2½"
Cleveland, Model A, 3¼" M.D.
Gridley, 2¼, 3¼ & 4¼" Single Spdle.
New Britain, No. 22
Automatic Threading Lathes, 13"x8' G.H.

BORING MILLS, 54" Niles, 2 Swivel Heads
42" Bullard, 2 Swivel Heads
Barrett Horizontal, 5" dia. Bar, x 16' long

DRILLS, Edlund, No. 1A, 4 spdl. P.f. No. 3 M.t. M.D.
Cincinnati 21" Direct Drive, M.D.
Baush & Natco Multiple spindles
Morris, 4' Radial M.D.
Henry & Wright, 1 to 8 Spdl., No. 2 mt.

GEAR CUTTERS, Fellows No. 6 Shaper

GEAR HOBBERS, Barber-Colman No. 3 & 12

GRINDERS, B. & S No. 2 & 3 Universal
B & S No. 12 & 16 Plain
Heald No. 65 Cylinder
Landis, 16x66" Plain
Norton, 16x36" Crankshaft
Norton, 10x24 & 36" Plain

LAPPERS, No. 15 Norton, M.D.

LATHES, Hendey, 14"x5' & 18x10'
Monarch, 14"x6' M.D.
Sundstrand Stub, 8" M.D.
Jones & Lamson, 3x36" M.D.

MILLS, Becker, Vertical, 30" Rotary Table
Becker Vertical No. 4B & Model B
Brown & Sharpe No. 2 Universal
No. 3B Brown & Sharpe, with Vertical Attachment, M.D.
Cincinnati No. 2 Plain

PRESSES, No. 94 Bliss, Solid Back
No. 68N Bliss Double Action Cam
No. P 3 & 4, & P G 2 For., Solid Back
No. 34 Toledo Solid Back, Geared

PLANERS, 26"x26"x5' Gray, M.D.
30"x30"x8' Cincinnati, M.D.

PROFILERS, P. & W. No. 13 Single Spindle
44"x44"x18' Niles, 4 Heads

SHAPERS, 16" & 20" Gould & Eberhardt
24" Rockford Hy-Service, S.P.D.

TAPPERS, No. 1, 2 & 2X Garvin
6 Spdl. Holmes Tilted No. 3

OTT MACHINERY SALES, Inc.
548 Second Ave., DETROIT, MICHIGAN

BORING MACHINES

No. 2 Barrett, 5" bar

BORING MILLS

30" Bullard, 1-turret head
42" Gisholt
14' Sellers

DRILLS

1, 2, 4 Spdl. Leland-Gifford.
2 Spdl. Foote-Burt Sipp
No. 2-4 Spdl. Leland-Gifford, Motor Spindles. Power Feed
1, 2, 4 Spdl. Henry & Wright.
4 spdl. Demco. Power Feed
No. 2—6 spdl. Leland
No. 2 Colburn, 1 Spindle
No. 3 Baker 2 Spdl. Cyl. Borer
No. 5D Moline 4 Spdl. Cyl. Borer
No. 17—2 Spdl. Foote-Burt Rail
No. 4—5 spdl. Foote-Burt Rail
No. 1 Baush Multiple
No. 3 Baush Multiple
4' Fosdick Sensitive
5' Western Heavy Plain
8' Western Heavy Plain

GEAR CUTTERS

No. 2 Bilton
No. 12 Barber-Colman Hobber.
No. ½ Pfauter Hobber.
No. 3-26" Brown & Sharpe.
No. 4—36" Brown & Sharpe
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows
No. 36BM G. & E. Rougher

GRINDERS

(*See page 416—special advertisement*
Hill-Clarke Cylindrical Grinders)

No. 2 Union Formed Cutter Grinder
No. 40 Bryant Wide Wheel, Oscillating
No. 2½ Universal (Bath Type)
No. 5 Springfield Planer Surface
No. 2—18" Gardner Disc
No. 18 Bryant Internal
No. 60 Heald Cylinder
No. 10 Lees-Bradner Spur Gear Grdr.
24" Cincinnati Face Mill

MFG. LATHES

3½"x36" Fitchburg Lo-Swing.
3½"x60" Fitchburg Lo-Swing.
3½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.
No. 4AC LeBlond Auto. Crankshaft

ENGINE LATHES

18"x6' Bradford Geared Head
21"x8' LeBlond Universal Turret
21"x10' LeBlond
24"x22' Lodge & Shipley, Taper Attach.
26"x10' Bridgeford
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
30"x12' Whitcomb-Blaisdell

MILLERS

No. 3 Becker-Brainard Plain.
Model CS Becker Vert. Continuous Rotary
5" Pratt & Whitney Automatic
24"x24"x12' Ingersoll Adj. Rail.
24"x20' Ingersoll Double Faced
36"x36"x12' Newton Duplex.
38"x44"x20' Ingersoll Slab.
No. 1 Smalley-General Thread.

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x12' American, 1 Hd.
36"x36"x12' American 2 hds.
36"x36"x18' Cincinnati
42"x42"x14' Gray, 2 heads.
48"x48"x10' Niles-Bement-Pond, 2 heads.
48"x48"x12' Gray, Reversing M.D.

PRESSES

No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 42½ Pels Beam Shear

TURRET LATHES

2¼"x26" Greenlee, Cross Sliding Turret
2¼"x26" Greenlee, A.C. and R.F.
3¼"x40" Greenlee
3"x36" Pratt & Whitney, A.C. & B.F.
3"x36" J. & L. 2 spdl.
21"x8' LeBlond Universal
21" Gisholt, 3¾" H.S.
24" Steinle, 6¼" H.S.

MISCELLANEOUS

15" Hendey Shaper
24" Mark Flather Shaper
No. 3-B J. N. La Pointe Broach
No. 4 J. N. La Pointe Broach
6" Saunders Pipe Machine
12" Bignall & Keeler Pipe Mach.
60" Quickwork Rotary Shear
No. 7 Burr Keyseater, 72" Feed
6½' Avey Metal Bandsaw

HILL-CLARKE MACHINERY CO.
645 W. WASHINGTON BOULEVARD, CHICAGO

Libby, 18" gd. hd., S.P.D. 3½" hole
Niles, 51" vert. Bor. Mill 2-hds.
Milwaukee, No. 3 pl. Miller S.P. MD.
Cincinnati, No. 4 Plain Miller
Ingersoll, 36x36x10 slab Mill
Fifield, 52"x16' Lathe
Lodge & S., 36"x16' g.h. Q.C. Lathe
LeBlond, 21x10 hvy. dty. qc. Lathe, 2
American, 20"x10' g.h. q.c. Lathe
Lehmann, 20"x12' qk. chg. Lathe
Monarch, 20x12' q.c. taper attach.
LeBlond, 20x8 g.h. q.c. rel. & taper attach. M.D.
Hendy, 16"x8' qk. chg. taper attach.
Lodge & S., 14"x7 q.c. taper attach.
Hendy, 14"x6' grd. hd. qk. chg.
Minster, Nos. 9 & 12 hvy. duty Drills
Baker, No. 314 heavy duty Drill
Leland-Gifford, 2-sp. pwr.-fd. M.D.
Fellows, No. 7 hi-sp. Gear Shaper
Fellows, No. 61 Gear Shaper
Gleason, 4" sp. bev. gear gen. M.D.
Cincinnati, No. 3 spur gear Cutter
Fellows, No. 4-T Thread Generator
Adams, No. 1 Gear Hobbers
National, Red Ring Gear Lap., M.D.
Bethel Lapper, No. 1-C-A M.D.
Kling, 8' pyr. rolls, 10" top, 8" bottom, ½" cap.
Waterbury-Farrel Bolt Header No. 1. S.D.D.S.
Brown & Sharpe, No. 1 Univ. Grdr.
Landis, 14x36" Grinder
Norton, 6x32 plain
Cincinnati, No. 3 face mill
Univ. semi-Auto. spline Grinders (2)
Landis, 1" dbl. hd. Threader lead scr.
Potter & J. 24" Shaper univ. table power down feed
Western, 6' Radial Drill, S.P.D.
Reed-Prentice 4' gear-box S.P.D.
Cleve. Op. Side Pl. 36x36x12 2-hds.
American Planer, 36x36x10, 2-hds.
Cincinnati Planer, 36x36x8, 2-hds.

F. W. BURNS MACHINERY CO.

1441 NORTH THIRD STREET, MILWAUKEE, WIS.

"IT CAN BE DONE" and "WE CAN DO IT"

HAVE MADE OUR AMERICA

Let us know what you need to open up the bottlenecks in your production lines.

511' 15 x 9 x 10 Chi. Pneu. O-CB Air Compressor, m.d.
3" Landis Bolt Cutter, grd. motor drive
3" Horizontal Knee Type Boring Mill
5 ton 28'1¾" Roeper Crane
3 way Garv. Drl.; No. 4 tap., p. fd. Index tbl.
Avey Sensitive Drill, 7" overhang, No. 2 taper
12" Rhienna Gear Cutter
12" Rochester Gear Tooth Rounder
No. 65 Heald Cylinder Grinder
Fisher Form Cutter Grinder
No. 2 Garvin Hole Grinder
10"x36" Landis Plain Self-Contained Grinder
No. 2—12x32 Landis Universal Grinder
48"x84" Diamond Face Grinder, hyd. fd., m.d.
38"x14' Fifield Lathe, single back geared
32"x20'10" Fifield Lathe, triple geared
32"x16'8" Fifield Lathe, triple geared
27"x38' Lodge & Shipley Lathe, m.d.
26"x14' Bridgeford Plain Turning Lathe, m.d.
20"x8' Prentice Lathe, geared head
14" Bardons & Oliver Facing Lathe
American Fox Lathe
13"x8' Auto. Mach. Co.'s Thread. Lathe, s.p.d.
13"x5' Auto. Mach. Co.'s Thread. Lathe, s.p.d.
No. 2 Warner & Swasey Turret Lathe
No. 24 Brown & Sharpe Plain Miller
No. 9 Kempsmith Plain Miller, cone drive
No. 31—72" Pratt & W. Dble. Spdl. Miller
No. 2M Potter & J. Mfg. Miller, s.p.d.
No. 23-6" Smalley Gen. Thd. Miller, 6" spdl.
66"x50"x10' Cinn. Widened Pattern Planer
36"x36"x14' Hamilton Planer, 3 hds.
22'—No. 6 Hilles & J. Plate Planer

500 Ton Ferracute Straight Side Press; tie rod construction; twin geared drive; bed area front to back and right to left 36"x 50"; 12" stroke; shut height 25"

No. 6 Hilles & J. Punch, 62" Throat
No. 14 Williams & White Punch, 36" Throat
RLUm8 No. 26 Pels "Johns" Punch, 24" Throat
No. 6 Whiting Horiz. Horn Stake Riv. & Punch
9'—75 ton Air Operated Stake Riveter
75 ton Albree Lattice Riveter
16"x24" 2-Hi Duplex Cold Strip Mill
16"x24" Bliss 2-Hi Cold Strip Mill
300 cu. ft. Beardsley & Piper Sand Slinger
18" Sellers Crank Slotter, 48" dia. table
14" Betts Crank Slotter
12" Bement Crank Slotter
300 Amp. Wilson Arc Welder

MISCELLANEOUS

36"—3 jaw scroll chuck
No. 6 West Hyd. Tire Setter, 18 Cyl. 30"x 63" Triplex Pump
6000 lb. Auto. Trans. 72" Tier Lift Truck
6000 lb. Lakewood 60" Tier Lift Truck
4000 lb. Auto. Trans. Low Lift Truck
No. 510—42" Newton Cold Saw, m.d.
6"x6" Peerless Hack Saw
100,000 lbs. Tinius Olsen Univ. Testing Mch.
Boring Mill Heads, new—Swivel
30 new Planer Heads; rail and side

MACHINE TOOL SALES COMPANY

513 N. 17th Street
Philadelphia, Pa.

BORING MILLS, Horizontal

4½" bar Bement Miles Knee Type
4½" bar N.B.P. Knee Type, 11' nose of spin. to outboard, MD.
6" bar No. 3 Barrett M. D.
7" bar Niles Horiz. Cylinder Boring & Facing, 114" swing, 11' between head and tailstock, extra large

BORING MILLS, Vertical

42" N.B.P. Car Wheel Borer
60" Betts 2 hds. M.D.

DRILLS, Radial

3' Bickford, Cone or M.D.
4' N.B.P. Universal, M.D.
5' Western S.P.D.
4' Dreses Plain
6' & 5' Cinci. Bickford, MD (2)
6 spin. Henry & Wright Sensi.
5 spin. Henry & Wright Sensi.
4 spin. Allen, Sensitive
1 spindle Sensitive
No. 11 Natco, 8 spin.
20" Sibley Upright
No. 13 P. & W. Multi
No. 13 Natco Multi.
36" Cinci. Bickf. Uprights, MD.
22¼" Barnes Upright
No. 2B Edlund 8", B.B.
No. 1½ Avey 7½", B.B.
Baker Type M. Tapping
Bausch No. 30 Multi spin. 30" round head 8 spin.

GRINDERS

No. 51 Oliver, 3" Twist Drill, M.D.
6"x20" Landis, Hyd. Feed
10"x6"x36" Norton Opns., Surf., M.D., 10"x40" chuck
16"x68" Landis Crankshaft
No. 6 Landis Cyl. Grinder
No. 3 Landis Universal
No. 2 Sellers Univ. Tool
18" Besly No. 26 Disc
20"x96" Landis Cyl. M. D.
20"x96" Landis Univ.
20"x216" Landis Cyl. M.D.
24"x 96" Landis Cyl. M. D.
30" x 240" Landis Roll M. D.
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife
3 HP Black, Decker emery M.D., 3/25/220
24" Blount Snagging

LATHES

14"x6' Monarch Q.C.G., Cone
16"x6' Sidney, Q.C.G.
17"x6' LeBlond, 3 cone
19"x12' LeBlond Grd. Hd.
22"/24"x12' L. & S., Q.C.G., M.D.
24"x12' Putnam Grd. Hd., M.D.

LATHES (Continued)

24"x15' N.B.P. Q.C.G., T.A.
25"x18' LeBlond, Q.C.G., T.A.
25"/50"x14' LeBlond, Gap, MD.
26"/48"x12' Harrington, Gap
26"x11' Wickes Heavy Cone
28"x12' Lodge & Shipley, M.D.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
36"x14' Rahn Larmon, Q.C.G., Cone
36"x25' Pond, 2 carr., Tri. Grd.
36"x27' Gleason. F. Plate Dr.
42" N.B.P. Center Dr. Whl.
14"x8' Hendey Yoke Hd., T.A.
42"x32' Pond, sgl. back grd.
48"x18' Fifield, blocks to 60"
90" N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.

MILLERS

36" Bliss Vert. or Die Sinker
No. 3 Newt. Miller, 30"x30"x6'
No. 6 Whitney Hand
No. 12 P & W Profiler, 2 spin.
No. 33 Kempsmith, Mfr.
No. 42 Ohio, Univ.
28" Cincinnati Semi Auto
42"x42"x8' Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand
No. 1 U.S. Hand, new

PLANERS

60"x60"x30' Gray, 4 hds., reversing motor drive with motor
60"x60"x14' Niles 4 hds.
48"x48"x16' Cinc. 4 hds., M.D.
42"x42"x16' N.B.P., M.D.
36"x36"x12' D. & H. Openside
26"x26"x8' Gray
24"x24"x12' American

TURRET LATHES

24" Gisholt 51" H.S., 3 cone
3"x36" Jones & Lamson, bar equipt.
2½"x26" P. & W. Grd. Hd.
No. 6 Brown & Sharpe, Screw
24" Gisholt, 6½" H.S., 2 cone
24" Steinle M.D. 6½", h.s., (4)
28" Steinle M.D. 8½", h.s.

MISCELLANEOUS

Automatic, ⅜"-¾" Cleve. Mod. A
Bolt Threader, 2" Landis
Bolt Threader, 2" Natl.
Bolt Threader, 1½" Landis
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Flanger, ¼" McCabe Pneu.
Gear Cutter, 24" Adams Farwell, No. 3 gear hobber
Gear Gen., 18" Gleason Bevel
Gear Shaper, No. 6 Fellows md.
Hammer, 70 lb. Scranton, Power
Hammers, 1500 lb., 1200 lb., 600 lb., McDougall & Potter, steam or air forging
Header, 1¼" Acme Rivet
Jarring Mach., Herman Jolt Mould
Keystr., No. 6 Catlin, 40" stroke up to 5" wide
Keystrs., Nos. 1 & 3 Bakers
Keystrs., Nos. 4 & 6 M & M, M.D.
Lapper, Norton Type 1C
Oil Groover, No. 1 Garvin
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Machs. 3" Stover M.D.
Pipe Machine, 2" Saunders
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Presses, No. 18 Bliss B. & Fl.
Press, 1000 ton Watson Stillman Horiz. Hyd. Forcing
Press, 400 ton N.B.P., 96" Horiz., Hyd., Loco. wheels
Press, No. 97H Toledo
Press, No. 58 Perkins S.S. Grd.
Press, No. 44 Adriance, Cam
Punch 54" H & J No. 2 D.E.
Punch, 48" Cleve. G, 2"x1"
Punch, 20" Pels, 1"x¾"
Punch & S., No. 22 Pels, tri., combn., armor, 6"x¾" angles, etc.
Punch & S., No. 91, Size 11 Smith, coping attachment
Punch & S., No. 20 Schatz Type
Rolls, Angle Bending, 4"x4"x½" Williams & White No. 2
Rolls, 12' Corrugating—Heavy
Rotary Table, 28" diameter
Saw, 6" Gorton No. 2B Inter.
Saw, Hack, 6" Racine
Saw, 24" Nutter Barnes Cold
Saw, 30" blade Espen Lucas
Saw, No. 2B Cochrane Bly 6"
Saw, No. 15 Lea Simplex
Shaper, 14" Steptoe
Shaper, 24" Queen City, M.D.
Shaper, 24" Cincinnati
Shaper, 36" Morton, railroad
Shear, 48" Rock River, Model F, cap. split ½" plate
Slotter, 10" Betts, Cone or M.D.
Slotter, 15" Putn., D.C., M.D.
Slotter, 18" Newton, Hyy. D.
Slotter, 19" Putnam, heavy
Slotter, 24" Dill A.C., M.D.
Swager, No. 6 Langelier, M.D.
Testing Mch., 100,000 lb. Riehle

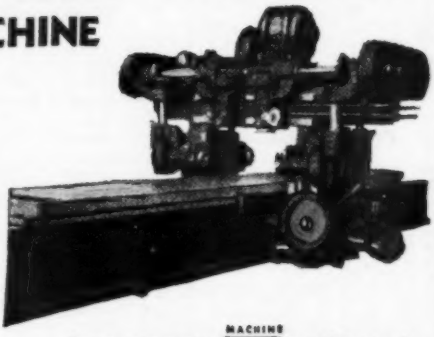
BENNETT & RAFKIN CO.

Offices: 30 CHURCH ST., NEW YORK CITY

INGERSOLL DOUBLE FACE TYPE - MILLING MACHINE

36' x 30' x 22'

Equipped with one left hand horizontal head, two right hand horizontal heads, one vertical on front side; one left hand horizontal and one right hand horizontal head on rear side.



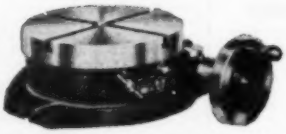
FOR IMMEDIATE DELIVERY

MACHINE TOOLS
DONBERG DANITS

400 S. Clinton St., Chicago, Ill.
Phone: Wabash 0123

BRAND NEW PRECISION

ROTARY TABLES



9' —	$ 97.00	
12' —	160.00	
15' —	185.00	
18' —	220.00	
18' —	350.00	HEAVY DUTY
21' —	500.00	HEAVY DUTY
25' —	590.00	HEAVY DUTY

OUR ROTARY TABLE WILL TAKE THE PLACE OF A COSTLY FIXTURE. IT IS USED FOR ALL KINDS OF WORK ON MILLING MACHINES, SHAPERS, DRILL PRESSES AND HORIZONTAL BORING MILLS.

WE CAN ALSO FURNISH DIVIDING ATTACHMENTS.

SEND FOR LITERATURE AND DETAILS.

FAST DELIVERY GUARANTEED.

LAFAYETTE TOOL & SUPPLY CO.

178 LAFAYETTE ST. **NEW YORK, N. Y.**

SEND FOR LITERATURE ON OUR OTHER PRODUCTS.

• • • IN STOCK

AUTOMATICS
No. 0 Brown & Sharpe
1-¼" Model A Cleveland
¾" Model F Gridley, four spindle
2¼" Model F Gridley, four spindle

BROACHES
No. 3 LaPointe

DRILLS
3' Cincinnati Bickford, radial
No. 2 Colburn S.S.
24" Barnes, Power feed
No. 12 Natco Multiple Spindle
No. 13 Natco Multiple Spindle
Natco 3 way Horizontal multi. spdl.

GEAR CUTTERS
15" Gleason Spiral Bevel
18" Gleason Gear Tester

GRINDERS
No. 2 Cincinnati Centerless
No. 10 Lees-Bradner, gear
No. 55 Heald Internal
No. 60 Heald Internal
No. 70 Heald Internal
22"x84" Pratt & Whitney Surface
No. 2 Brown & Sharpe Universal
10"x20" Landis Cylindrical
16"x50" Norton Crankshaft
18"x96" Brown & Sharpe Cylindrical
No. 20 Bryant Chucking
20 A Bellevue Drill
Ingersoll Cutter, Tub Type

LATHES
14"x6' Monarch, C.D.
16"x6' Lodge & Shipley, c.d.
16"x8' American, g.h.
18"x8' Monarch, c.d.
21"x8' LeBlond—C.D.
18/36"x12' Rahn Larmon Extension Bed Gap
3½x60" Fitchburg Lo-Swing—G.H.
8"x60" Fitchburg Lo-swing, g.h.
11"x5' LeBlond Production, g.h.
14"x6' LeBlond Production, c.d.
18"x7' Chard Production, c.d.

TURRET LATHES
No. 1B Foster
Model C 26" Libby
No. 2A Warner & Swasey
No. 3A Warner & Swasey
No. 1 Warner & Swasey
No. 4 Warner & Swasey
No. 6 Warner & Swasey
No. 7 Bardons & Oliver
No. 9 Bardons & Oliver
2¼x24 Jones & Lamson
No. 6A Potter & Johnston Auto.

MILLS, BORING
52" Gisholt vertical, m.d.

MILLS—Plain
No. 3B Kearney & Trecker, s.p.d.
No. 3 Cincinnati, c.d.
No. 14A Garvin, C.D.
No. 1 Bristol, Hand
U.S. Hand

MILLS, UNIVERSAL
No. 2 Cincinnati, s.p.d.
No. 2A Garvin, c.d.

MILLS, VERTICAL
No. AB Becker, c.d.
No. 4B Becker, c.d.

OIL GROOVER
Wicaco Continuous

SAWS
12"x16" Peerless, M.D.
No. 4 Atkins Band—M.D.
No. 12 Higley Cold Cut
No. 6 Nutter & Barnes

SHAPERS
16" Hamilton, C.D.
20" Cincinnati, C.D.
24" Cincinnati, C.D.
24" Cincinnati, S.P.D.
28" American, s.p.d.

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LATHES

20"x8' American
18"x16' Hendey
24"x12' South Bend
15"x7' South Bend
15"x8' South Bend
14"x6' Rockford
18"x10' Rahn-Larmon

DIE NIBBLER

Gray Roller, 3/8" cap. 36" throat

GRINDERS

6"x18" Landis Plain Cyl. M. D.
12"x72" B. & S., plain Cyl. mtrzd.

PLANERS

26"x26"x8' Cincinnati, one head
24"x24"x6' Gray, one head

RADIAL DRILLS

4' Bickford, S.P.D., gear box
6' Bickford, cone drive

SHAPERS

16" Queen City
17" Averbeck
20" Hamilton

TURRET LATHES

No. 2 Warner & Swasey
No. 2 Milholland
No. 2 Bardons & Oliver
No. 3 Foster
No. 9 Bardons & Oliver
3"x36" J&L Grd. Hd. Flat Tur.Lathe

AUTO. SCREW MACHINES

2" Cleveland, Model A
¾" Cleveland, Model A
⅜"-½" Cleveland, Model A

MILLING MACHINES

6"x48" Pratt & Whitney Thrd. Miller
No. 3 Ohio Plain Milling Machine

Inland Machinery Company
41 So Clinton St Chicago, Ill.

Turret Lathes: Warner & Swasey No. 4 Univ. Back Gear Friction Hd., bar equip. W & S No. 6 P.F. to cross slide and tur. Gisholt 24"—6¼ hole in spindle, M.D. Millholland No. 4—BG. Fric. hd., bar eq.
Milling Machines: Brown & Sharpe No. 2 Universal, with full equipment
Pratt & Whitney No. 10 Auto.
Pratt & Whitney No. 12—2 spdl. Profiler
Lathes: American 27x16, Geared Head
American 20x12 D.B.G.
Lodge & Shipley 14x6—12 speed Geared Head, M.D.
Monarch 12x5 Geared Head, M.D. (2)
Boye & Emmes 24x16 D.B.G., T.A.
Boring Mills: Niles 30" Vertical, Cone Dr., Geared Feeds
Barrett No. 0 Horizontal 3" Bar
Planers: Cincinnati 42x42x12'—3 heads
Grinders: Abrasive No. 33 Surface, M.D.
Landis 12x36 Plain, S.P.D.
Landis 6x18 Plain, M.D.
Oliver Drill Grinder, Motor in Base (2)
Drills: Dreses Radial 6' Arm—S.P.D. thru gear box
Canedy-Otto 3' Radial Motor on Spindle
Shaper: Steptoe 16" Timken Bearings SPD.
Gear Machines: G & E—No. 12H, S.P.D.
G & E No. 36B for Spur and Bevel Gears, M.D.

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26" Libby Geared Head Full Univ. 4½" hole in spdl.—chk., face plates, pot chucks, boring bars, tools
16"x6' Hendey Q.C.G. Engine Lathe, yoke head type with chuck, taper, pan bed
No. 1 Cincinnati Univ. Mill M.D.
No. 2 Owens Univ. Mill M.D.
No. 3 Cincinnati Plain Mill M.D. with Halco Hi-Speed Vert. Head
No. 310 Baker H.D. Drill S.P.D.
6"x15" Fitchburg Plain Cyl. Grinder. Belt drive. Can be motorized
No. 60 Heald Internal Cyl. Grinder
V-20-12 ton American Vert. Brch.
No. 19—53" Besley Vert. Spdle. Disc Grinder

OTHER MACHINES IN STOCK

MILLS

2½" Binsee Horizontal Boring Mill—Knee type—Power feed
2-No. 24 Bliss Vertical Die Sinkers with long power feed to 24" dia. rotary table. Can be used as vertical Mills Fine Condition
2-No. 2 P. & W. Vert. Die Sinkers
18" Cincinnati Automatic
2A-Becker Vertical—Rotary table
No. 5 Becker Vert.—Extra long table
No. 3 Hendey Norton Plain with Heavy Dividing head & tailstock. Feeds in all directions M.D.
No. 5B Becker Horiz. Plain
No. 3 Knight Vertical M.D.

DRILLS

4' Niles Bement Pond Full Univ. Radial No. 4 M.T.—4 speed AC MD. with M & Controller—Box Table 11" Col. Rev. Spdl.
2½'—3'—4' Plain Radials M.D.
5 & 6 Spindle Moline Hole Hogs No. 3 M.T.
1-2-4 Spindle L & G—H & W Sens.

LATHES

12"x5' Hendey—Taper—Chuck
16"x6' American—Taper—2 chucks
18"x8' American—Chuck
20"x10' Schumacher-Boye—Taper
26"x16' Bridgef. & Gleason—Tapers
42"x22' American L.C.G. Chk. & Eq.

GRINDERS

Capitol Internal—M.D.
2-No. 6 Bryant Internal—Extra spdl.
No. 18 Bryant Internal
36" Bath Univ. Head and Tailstock
1-Modern Plunge Cut Form Cyl. Live centers—Hopper feed. Never used M.D.
6"x18" Landis Plain—M.D.
10"x36" Landis Plain M.D.
No. 3 Diamond Surface—48" travel

MISCELLANEOUS

No. 10½ Higley Cold Saw md 6" cap.
3-No. 12 Barber Colman Gear Hobs.
½" National Bent Tapper
12"-14" Sellers & Bement Vert. Slot.
No. 7 Foster Turret Lathe—Power cross feed and tools
3 ton Automatic Hi-Lift Truck with rebuilt Ready Power Unit
2—4 way Natco Multi Spindle Drills 2 heads opposed—1 at rear—1 vertical — 34 spindles No. 1 Morse taper—4 motors & controls
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36"x36"x8' Detrick & Harvey Open-side Planer—2 Rail Heads, 1 Side Head. Self-contained M.D.
4-No. 7 L S Fellows Gear Lappers, M.D. like new
Model D Hall Planetary Mill
1¼" and 2 3/16" Mod. A Clev. Auto.
2—4 way Natco Mult. Spindle Tappers—2 heads opposed—1 at rear—1 vertical—34 spindles—motors and controls
Gisholt Dynamic Balancing Machine
Marquette Type EEL—206 Double Die Cushion—30"x60" ASME tank, pressure gauge, safety valve & ¾" Mason Regulator

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No. 3 Cincinnati Vertical Miller
2-No. 2 Cinn. Cent. Grnds.
14' Swing Sellers Vert. Bor. Mill

DRILLS—20" & 24" Barnes Uprights
D-25—16 Sp. Fox Mult.
No. 400 Barnes Double End Facer
GEAR CUTTERS—No. 3—36" B & S
No. 5—60" B & S
36" Fellows Gear Shaper
11" Gleason Bevel Generator
GRINDERS—No. 6 & No. 20 Bryant Int'a.
2-10"x36" Thompson Univ.
LATHES—1"x18" P & W. Auto. Lathe
36"x12' L & S Pwr. Ang. Fd.
16"x10' Springfield
36"x20' Le Blond

14" Pratt & Whitney Surf. Grnd.
2—Model U Lo Swing Lathes, Tmk. Br.
2A Warner & Swasey Turret Lathe

LATHES TURRET—3"x60" & 8"x60" Fitchburg Lo Swings
MILLERS—No. 1 & No. 2 Cinn. Plain
No. 3 Garvin Univ.
No. 2 Kent-Owens Hand
No. 54 & 55 Consol. Forge Trimm.
Type D—144" L & A Mult. Punch 500 T.
MISCELLANEOUS—2—No. 2 La Pointe Brchs.
36"x10' Gray Planer
No. 22 U. S. Wire Former
1—Wicaco Oil Groover

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No. 3 Cincinnati-Acme Univ. 3½"x36" Tur. Lathe with cross slid. tur., bar work, ta., md.
No. 2-A W. & S. Univ. Turret Lathe, S.P.D.
No. 4 Warner & Swasey A.G.H. Turret Lathe, A.C. and B.F., motor in base
No. 3 B. & O. G.F.H. Screw Machine, A.C. & B.F., P.F. to turret, B.D.
No. 5 Foster G.F.H. Screw Mch., A.C., B.D.
No. 2 Kempsmith Univ. Maximiller, arr. M.D. in base
No. 2G Brown & Sharpe Automatic, vert. cutting-off att., motor in base
16"x8' Lodge & S. Q.C.G. Lathe, T.A., chks.
18"x10' Springfield Q.C.G. Lathe, T.A., 3 and 4 jaw chucks, B.D.
21"x10' LeBlond Q.C.G. Lathe, D.B.G., B.D.
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Ingersoll Slab Miller, 36"x10' with three vert. spindles, adj. rail
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No. 2 Leland-Gifford Single Spindle Drill
No. 3 Avey 4-Spindle Drill
16" Bilgram Bevel Gear Generator
No. 1 Townsend Riveters (5)
No. 2 Townsend Riveter
No. 8 Bliss Press
Harvey Hubbell Horiz. Tappers, B.D.
No. 65 Heald Internal Grinder
No. 16 Namco Horiz. 6-spdl. Cotter Pin Drilling Machine

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MILLERS
No. 3S Cincinnati Plain, s.p.
No. 2 Cincinnati Vertical m.d.
No. 1½ Cincinnati Universal, cone
No. 1B Brown & Sharpe Plain, s.p.
No. 2 Brown & Sharpe Plain, cone
No. 3 Becker Plain, cone
Hardinge Precision Bench Type
No. AB Becker Vertical, rotary table
No. 3 Becker Vertical
No. 4 Becker Vertical m.d.

LATHES
2—Porter Cable, s.p.
20"x12' L&S 12 speed, g.b., m.d., t.a.
24"x10' L&S, cone, t.a., m.d.
20"x18' L&S, cone, t.a., m.d.
18"x10' Lodge & Shipley, cone, t.a.
14"x6' Monarch Q.C.G.
16"x38"x12' Fay & Scott Gap

RADIAL DRILLS
3½' American Triple Purpose, m.d.
3' Morris, G.B., m.d.

TURRET LATHES
24"x26" Pratt & Whitney, g.b.
30" Warner & Swasey Vertical
No. 4, No. 6 Warner & Swasey
No. 3, No. 4, & No. 7 Bardons & Oliver
No. 0 Brown & Sharpe
24" Acme

AUTOMATICS
No. 55 Nat'l. Acme, 4 spindle

SHAPERS
24", 28" Gould & Eberhardt, s.p., m.d.
25" Davis, s.p., m.d.

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HIGH GRADE TOOLS

LATHES

14"x6' American Bowl Hd. 4 S.C.D. B.G. Q.C.
16"x8' Hendey Lathe, 4 S.C.D. B.G. T.A. Q.C.
18"x8' Mueller Lathe, 3 S.C.D. D.B. G. Q.C.
18"x8' Sidney Lathe, 3 S.C.D. B.B.G. Q.C.
18"x8' American Lathe, 3 S.C.D. D. B.G. Q.C.
18"x8' American Lathe, 3 S.C.D. D. B.G. Motor driven
18"x8' Greaves Klusman Grd. Hd. Lathe Q.C. T.A.
18"x8' Greaves Klusman Grd. Hd. Lathe, Q.C. M.D.
18"x8' Boye & Emmes 3 S.C.D. D. B. G. Q.C.
18"x8' LeBlond 3 S.C.D. D.B.G. Q. C. motorized
19"x12' Sidney H.D. 3 S.C.D. D.B.G. T.A. Q.C.
20"x16' Greaves Klusman Grd. Hd. Q.C. T.A.
21"x8' LeBlond H.D. 3 S.C.D. D.B. G. Q.C.
24"x10' Lodge & Shipley 3 S.C.D. D. B.G. Q.C.
25"x16' LeBlond H.D. 3 S.C.D. D.B. G. Q.C.
36"x20' Putnam 5 S.C.D. B.G.
42"x16' Boye & Emmes H.D. 5 S.C.D. Trip. Grd. Q.C.

PLANERS

36"x36"x10' Detrick & Harvey Open-side Belt Drive

RADIAL DRILLS

3' Morris Plain Radial Drill S.P.D.
2—4' Bickfd. Pl. Radial Drills, S.P.D.
6' Bickford Pl. Radial Drill. S.P.D.

GEAR MACHINERY

No. 3-26" B & S Automa. Gear Cut.
No. 1 Adams Farwell Gear Hobber
No. 3 Adams Farwell Gear Hobber

SHAPERS

24" Rockford H.D. Cone Drive
24" Steptoe H.D. Cone Drive

HORIZONTAL MILLS

3" Lambert Horizontal S.P.D.

GRINDERS

12"x36" Landis Self Contained Plain
14"x72" Queen City Self Cont. Plain
16"x52" Landis Crankshaft Grinding Machine, M.D.
No. 55 Heald Internal Grinders
Cataract Precision Grinder
No. 51 Oliver Drill Grinder M.D.
No. 5 Oliver Drill Grinder M.D.
No. 29-53" Besley Disc Grinder
12" Pratt & Whitney Surf. Grinder

TURRET LATHES

No. 2 Warner & Swasey Tur. Lathe
1½" Millholland Turret Lathe

MISCELLANEOUS

No. 35 Niagara Presses, Belt Drive
Quickwork Rotary Shear
No. 1 Klemm Metal Band Saw
Atkins Metal Cutting Back Saw
35 K.W. Federal Spot Welder
No. 1 Baker Keyseating Machine
2" Acme Bolt Cutter
2" Landis Bolt Cut. with Lead Scrw.
No. 1 LaPointe Broaching Machine
2" Landis Pipe Threading Machine
C12 Natco Multiple Drill
20 spindle No. 2 M.T. Natco Drill
1" Roller Pipe Cutting Machine
Savage 3/16" Nibbler
Savage ⅜" Nibbler

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2 24" Steinle Turret Lathes
2 3B Foster Turret Lathes
1 Fox Type Turret Lathe
1 2"x24" Jones and Lamson Turret Lathe
1 3"x36" Jones and Lamson Turret Lathe
1 28" Gisholt Turret Lathe
1 28"x10' New Haven Engine Lathe
2 17"x6' Le Blond Engine Lathes
1 17"x8' LeBlond Production Lathe
4 25"x12' Le Blond Heavy Duty GH Prod. Lathes
2 25"x14' Le Blond Heavy Duty GH Prod. Lathes
3 No. 2 Warner & Swasey Turret Lathes
1 14"x6' Reed Prentice Geared Hd. Lathe
1 14"x19" Fay Automatic Lathe
1 36" Cincinnati Horizontal Borer
1 3-¾" Barrett Horizontal Boring Mill
1 Coulter Vertical 2 spindle Diamond Bor.
1 4" Niles Horizontal Boring Mill
1 24"x24"x6' Ingersoll Slab Mill
1 36"x30"x22' Ingersoll Mill
1 No. 1½ Cincinnati Plain Mill
1 No. 2 Cincinnati Plain Mill
1 No. 3 Becker Plain Mill
1 2½' Dreses Radial Drill
1 2½' American Radial Drill
1 2½' Mueller Radial Drill
1 5' Niles Radial Drill
1 D2 Colburn Drill
1 5A Lees Bradner Gear Hobber
1 No. 12 Barber Colman Hobber
1 36" Fellows Gear Shaper
1 20" Rockford Shaper
1 16" Hendey Shaper
1 No. 2 Bath Universal Grinder
1 No. 16A Blanchard Grinder
2 No. 65 Heald Grinders
1 No. 14 Brown and Sharpe Grinder
1 16"x60" Modern Plain Grinder
1 Springfield Planer Type Grinder
1 Greenfield Cutter Grinder
1 1F Norton Lapper
1 4" Ajax Upsetter
1 No. 0 Ajax Forging Roll
2 Ajax Rivet Headers
1 48"x48"x16' Pond Planer
1 100,000 lb. Riehle Testing Machine
2 275 Ton Hydraulic Presses, 4 post type
1 Shepard Pinch Bug Riveter
1 Williams and White 48"x11/16" Shear
1 No. 3 Ryerson Friction Saw
1 4½" Model H Gridley Chucking Mch.
1 2A High Speed Hammer

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40"x20' HOUSTON STANWOOD & GAMBLE Triple Gear, Q. C. G. Taper & Equip.

40"x14' Gleason, D.B.G., Q.C.G., Eq.

28"x20' Schumacher-Boye, D. B. G., Q.C.G., Taper and Equipment

No. 3 Becker Vert. Miller—Equipt.

No. 2 Landis Grinder—Univ. Head

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ATLANTIC MACHINERY EXCHANGE

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AUTOMATIC SCREW MACHINES

Gridley ss. 3¼" D.C. motor drive
Gridley 1¼" Mod. F 4 sp. (4)
Gridley ¾" Mod. F 4 sp. (10)
Acme No. 56 Mod. A 4 sp.
Acme No. 53 Mod. A 4 sp. (12)
Acme No. 52 Mod. A 4 sp. (3)
Cleveland Mod. A s.s. 2¼"
Cleveland Mod. M 4 sp. ⅞"
Cleveland Mod. B s.s. ⅞" qrd. hd.
Cleveland Mod. A s.s. ⅞" (2)
Cleveland Mod. B s.s. 1½"
Warner and Swasey 3⅛" cap., bar feed

CHUCKERS

Goss and DeLeeuw 6"x8¾"
Potter and Johnston 5A
New Britain No. 32, 6 sp.
New Britain No. 432, 4 sp.
New Britain No. 632, 6 sp. (2)

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AUTOMATICS
1" Cleveland Model J double end
1¼", No. 55 Natl. Acme 4 spdl.
14" Fay chucking
No. 24 New Britain chucking
No. 33 New Britain chucking
No. 34 New Britain chucking
No. 6A Potter & Johnston
18" Gisholt Simplimatics

BULLDOZERS
Nos. 23, 5 & 29 Williams & W.

DRILLS
21", 25", 28" Superior
21" & 24" Cincinnati
Nos. 121, 314, 315, 321 Baker
20" Colburn No. 2 1, 2 & 4 spindle
20" & 24" Barnes AGSO
24", No. 25 Foote Burt
36", No. D8 Colburn, 5" cap'y.
Nos. 11, C12, 14 & 30 Natco multiple
Nos. 0 & 00S Garvin duplex
5 Spdl. Detroit automatic
Nos. 15¼ & 16 Foote Burt
Nos. 11D & 16D Moline Holehog
No. 10D Moline cylinder borer
4 spdl. No. 2 Foote Burt rail
5' Cincinnati radial
3½', 5' & 7' Western radial
4' Hammond radial
6' American radial
All makes sensitive

GEAR MACHINERY
Nos. 12HS & 18H Gould & Eb.
No. 12 Barber Colman
24" No. 3 Adams Farwell hob
8"-10" No. 1 Lees Bradner hob
14", No. 5A Lees Bradner hob
26", No. 3 Brown & Sh. auto.
36" Gould & Eberhardt auto.
48" No. 4 Brown & Sharpe auto.
60" No. 5A Cincinnati auto.
15" Gleason quenching press
Gleason bevel gear tester
Nat'l Tool Co. cutter checker
Lipe 2 spdl. chamferer
No. 3 Barber Colman hob grdr.
No. 2 Schuchardt & S. hob grdr.

GRINDERS, CYLINDRICAL PLAIN AND UNIVERSAL
6"x32" Norton
10"x20" Bath No. 1 universal
10"x24" Landis
10"x36" Bath No. 2½ universal
10"x36" Norton
10"x50" Norton
10"x52" Landis
12"x36" Landis self contained
12"x72" Landis
16"x42" Landis No. 3 universal

GRINDERS, MISCELLANEOUS
17"x36"-48" Norton hydraulic crk. pin, type B, Mod. 84
No. 2 Heim centerless
Pratt & Whitney Worm
14" Pratt & Whitney BB surface
Hutto MD honer
Norton lappers, type 15
No. 72A 3 Heald airplane cyl.
No. 75 Heald internal
No. 6 Bryant internal
24" No. 84 Gardner disc
53", No. 24 Gardner disc
30"x84" Diamond face

ENGINE LATHES
14"x6' Monarch
14"x6' LeBlond
14"x8' Lodge & Shipley
14"x8' Monarch
16"x6' Cincinnati
16"x6' Monarch
18"x8' American
16"x10' Monarch
18"x6' Rahn Larmon
18"x8' American
18"x8' Walcott
18"x8' Monarch
19"x8' Sidney
20"x10' American
20" (22") x10' Davis, dbl. b-gd.
24"x10' Schumacher & Boye, dbl. back gears, taper att.
24"x10' LeBlond heavy duty, dbl. back gears, taper att.
24"x10' Hendey stand. chge gr.
24"x10½' New Haven
24"x12' Lodge & Shipley
24"x14' Schumacher & Boye
24"x16' Schumacher & Boye dbl. back gears, taper att.
36"-42"x18' New Haven Q.C.G.
36"-47½"x21'6" Wickes Q.C.G.

LATHES, TURRET
No. 3A Warner & Swasey
14" Warner Swasey
No. 4 Foster
No. 4 Acme 18" swing
2½"x26" Acme
No. 4 Bardons
2¼"x24" & 3"x36" Jones & L.
No. 3 Gisholt, 18" swing
21" Gisholt
24" Steinle

LATHES, PRODUCTION
9" Rockford Mfg.
No. 9 LeBlond Multi-cut
13"x4' LeBlond geared head
13"x6' Automatic thread. lathes, geared head
16"x10' LeBlond rapid product.
16"x5' Monarch Mfg. cr rapid production
18"x7'-6" Wickes geared head, rapid production
18" Gisholt Simplimatics
Melling 4-cylinder Camshaft lathe
Melling 6 cyl. Crankshaft lathe
34"x61½"between spindles Wickes semi-auto. center dr. crkshaft.
9"x14" Porter Cable
11" LeBlond rapid production

BORING MILLS
36" Niles car wheel
42" Niles
60" Bullard
60" Colburn

MILLERS
No. 2 Owen universal
No. 34 Ohio plain
No. 14A Garvin plain
No. 3 Van Norman duplex
No. 3¼ Fox hand
Nos. 3 & 4A Becker vert.
No. 5 Brown & Sharpe vert.
No. 6 Becker vertical
Nos. 1 & 1½ Knight vert.
Mod. C Becker rotary
48" Newton rotary
60" Ingersoll rotary
Nos. 1 & 1A Davis & Thompson
No. 45 Bilton Productomatic
48" Ohio tilted offset
12" Cincinnati plain Mfg.
No. 2M Potter & Johnston auto.
No. 33 Kempsmith Mfg.
No. 30 Sundstrand Rigidmil
25"x25"x14' Ingersoll Slab
No. 6 Lees Bradner thread
No. 3C Lees Brad. col. type thd.

PLANERS
24"x24"x5' Gray
24"x24"x24" Cincinnati crank
24"x24"x6' Gray
24"x24"x6' Woodward & Powell
26"x26"x8' American
30"x30"x10' Cincinnati
32"x32"x12' Niles
36"x36"x10' Woodward & Pw.
56"x56"x16' Gray

PRESSES
4' Cincinnati press brake
No. 7 Toledo
No. 21¼ Bliss O.B.I.
No. 34 Wat. Farrel O.B.I.
No. 62 Bliss Openback
No. 76 Toledo openback
No. 6 Wat. Farrel openback
28" Swaine dbl. cr., 35 ton
44" Leffler dbl. cr., 88 ton
No. 65 Bliss Consolidated S.S.
No. 4 Massilon S.S.
No. 53 Toledo S.S.
No. 7 Rockford S.S.
No. 8-7 Zeh & Hahnemann S.S.
Nos. 55½ & 57S Toledo S.S.
No. 30 E Cleve., 1300 tons S.S.
No. 180 Toledo toggle
No. 796½D Toledo toggle
750 ton Baldwin Southwark triple action hydraulic
No. CA 14 Ferracute
No. 41A Toledo horn
No. P2 Ferracute
No. 2 Standard screw

PUNCHES
No. 65 Williams & White univ. ironworker
No. 54 Beloit combination
12", 14x1 Long & Alstatter
12", 1¼"x1" Cleveland horiz.
26", 3"x1" Cleveland
26", 4"x1" Rock River

SHAPERS
7" Rhodes
15" American
16" Walcott
20" Smith & Mills
22" Ohio
24" Gould & Eberhardt

TAPPERS
Nos. 1 & 2X Garvin
Natco lead screw, 1 & 2 way
9/16" Hammond

THREADERS
¼" Acme 2 spdl.
¼" Webster & Perks 2 spdl.
1¼" Geometric
1¼" & 2" Landis double
1" 2" & 2½" Landis single
2" Landis double, pipe & nipple

UPSETTERS
1¼" Ajax continuous motion
1¼" Acme stop motion
1¼" American No. 6
2" Nat'l, guided ram, late type
2½" Ajax twin geared with suspended slides
4" Ajax, original model
4" Ajax twin geared, suspended slides

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TAILSTOCK TURRET FOR LATHES

PRICE

$18.95

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A new, improved, tailstock turret for bench lathe, engine lathe or screw machine. It quickly converts a bench lathe or an engine lathe into a screw machine for small runs of parts. This tailstock turret is compact and accurate and will give long satisfactory service. The turret is 2½" in diameter and has six bored ⅝" holes held to very close tolerance. Furnished arbors with turret are either No. 1 or No. 2 Morse taper.

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"MACHINES HARD TO FIND"

2" Landis Double Head Bolt Cutter
3" Landis Single Bolt Cutter with lead screw
16"x10' Hendey Tool Room Lathe, m.d., with taper
1—30"x36"x20' Whitcomb Planer, 2 hds. on cross rail, m.d.
1—30"x30"x8' Gray Spur Gear Planer, 2 hds.
Rockford Single End Hydraulic Boring Unit with 2-sta. 54" dia. table
1—No. 3 Barrett 6" bar Cylinder Boring Machine, m.d.
1—No. 60 NATCO 3-way Mult. Spdl. Drilling Machine, m.d.
C-13H NATCO Hydraulic, m.d.
No. 14 NATCO Multiple, with 12 spindles 16x24 head
No. 30 NATCO 24x40" head
No. 40 NATCO Straight Line Multiple Drill
1—6' Niles Plain Radial Drill

Your inquiries will be appreciated.

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REBUILT & GUARANTEED MACHINES

List of machine tools in stock which can be rebuilt to your specifications.

BORING MILLS—horizontal

4" Betts Knee Table Type
4¾" Niles Knee Table Type
4½" Ryerson Floor Type

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42" Niles Standard, Motor Drive
48" Niles Wheel Borer, Motor Drive

GEAR CUTTERS:

36" G & E Auto. Gear Cutters
60" G & E Auto. Gear Cutters
72" G & E Auto. Gear Cutters
No. 12 Barber-Colman Hobbers

GRINDERS:

20"x96" Landis Cyl. Motor Drive
24"x96" Landis Cyl. Motor Drive
30"x240" Landis Cyl. Motor Drive

ENGINE LATHES:

36"x25' Pond, 2-Carriages
36"x27' Gleason Belt or Motor Drive

MILLERS:

No. 12 B & Sh. Manufacturing (2)
24" Cincinnati Automatics (3)
28" Cincinnati Semi-Automatics (3)
No. 2-V Potter & Johnson Vertical
37"x37"x14' Ingersoll Horiz. Spindle

PLANERS:

1-30"x30"x12' Whitcomb, 2-heads
1-36"x36"x12' Betts, 4-heads
1-36"x36"x16' Niles, 4-heads
2-42"x42"x12' Cincinnati, 2-heads
3-42"x42"x12' Pond, 2-heads
1-42"x42"x16' NBP, 3-heads
1-47"x40"x12' Gray, 2-heads
1-48"x48"x16' Putnam, 4-heads
1-60"x60"x18' Niles, 4-heads
1-78"x70"x27' Bement, 3-heads
1-72" Morton Portable

NEW MACHINES — IMMEDIATE SHIPMENT
6"x18" Surface Grinders—PRECISION TYPE
12" Slotters—Dual Control, Motor in Base
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Excellent facilities for rebuilding of large machine tools.

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IMMEDIATE DELIVERY
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3 JAW SCROLL CHUCKS

7—24" Gisholt Chucks
7—22" Gisholt Chucks
4—12" Skinner Chucks
1—10" Skinner Chuck
7—10" Gisholt Chucks

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10¾" Skinner 4 Jaw Independent
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22" Gisholt 4 Jaw Independent
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1—12" Union Ball Brg. Valve Chuck
4—18" Gisholt 3 Jaw Mfg. Chucks
1—15" M. E. C. 3 Jaw Mfg. Chuck
2—15" Hannifin 3 Jaw Mfg. Chucks
1—16" Hannifin 3 Jaw Mfg. Chuck
1—12" M. E. C. 3 Jaw Mfg. Chuck
2—18" Hannifin 4 Jaw Duplex Chks.

AIR CYLINDERS

2—16" Hannifin Model NB Air Cyls.
1—14" Logan Model J Air Cylinder
1—12" M. E. C. Model J Air Cyl.
1—15" Hannifin Air Cylinder
1—10" Hannifin Model NB Air Cyl.
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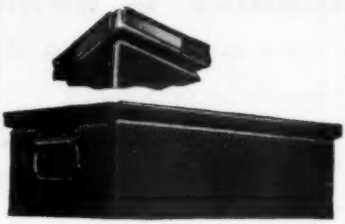
20,000 New Stacking Boxes



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Weight 15 lbs. Well constructed.

24"x15"x7½—18 gauge, drop handles both ends. Lots of 25 or more.

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Turret Lathes: No. 2 Warner & Swasey (3)
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Turret Lathe: No. 6 Warner & Swasey
Turret Lathe: No. 4
Automatic Screw Mach.: ¾" Gridley 4 spindle
Lathe: 18"x8' Monarch, Q.C., back geared
Lathe: 16"x6' Hendey, Q.C., yoke head
Lathe: 14"x6' Hendey, Q.C., G.H., T.A.
Lathe: 16"x10' Whitcomb Blaisdell, Q.C.
Engine Lathe: 12"x6' W.C. Young, B.G., Q.C.
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Press: Power, Bliss No. 4, Stiles, C.B.
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Several Large Planers

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No. 22 Natco Multiple 24 Spdl. Rec. Head, 13½"x31" area
No. 13 Natco, 16 Spindles
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24" Cinc. Uprt. Pwr. Fd. Back Grd.
16" Superior, H.S., B.B.
1 & 2 Sp. Demco, H.S. B.B.
2 Spdle. Avey H.S. B.B. No. 2 M. T.
No. ¼ Avey Bench Drill
1 Sp. Allen, P.F. & T.A.
No. 1&2 Leland-G. b., tap. Att.
4' Western Mfg. Type, Plain Radial, M.D.
3' Cinc. Bick. Radial, S.P.D. Box Tble.
3½' Cinn-Bick. Radial, M.D.

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27"x18' LeBlond Q.C.G., Tap. Att.
24"x16' So. Bend Std. C. G. Tap. Att.
24"x10' L. & S. Q.C.G., B.G.
18"x10' Sidney Q.C.G. Tap. Att.
16"x8' Greaves Klusman Grd. Hd., Q.C.G.
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LATHES, TURRET

24" Steinle, 6¼" Hole Thru Spdl.
No. 1 Foster Hand

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7½ HP U. S. Snagging
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No. 2 Lucas Auto. Surf., M.D.
No. 23 Baxter D. Whit. Int.
No. 70 Heald, Belt Drive
No. 1 Cincinnati, tool & cut.

MILLING MACHINES

No. 0 Bristol, Hand
No. 5 Becker Plain
No. 3S Cinc. Hi-Pwr. Plain, Sgl. Ply. M.D.
No. 5A B&S Grd. Hd. Univ. Sgl. Ply. M.D.
No. 3 Cinc. Plain, M.D.
No. 2 LeBlond Univ. B.G. Cone Hd.
No. 6 Whit., Hand, BD&MD.
No. 2 P & W Hand
No. 3 Becker Vertical
No. 1 Kempsmith Univ., B.G. 6"x48" Pratt & Whit. Thread
No. 33 Kempsmith Plain, MD. 13x67" Table P.R. Trav.

PRESSES

No. 1 Bliss Cam, Fly
No. 166 Cons. Sgl. Grd. Fric. Clutch

SHAPERS

25" S&M B.G. Cr., MD. gr. b.
24" G&E Back Geared Crank
21" Averbeck BG. Crank, Cone, Motor Drive
20" Steptoe b.g. crank
16" G&E Back Geared Crank

SCREW MACH., AUTO.

No. 00G B&S, M.D.
No. 0 B&S, Turner UniDrive
No. 0 B&S, Slot Att.

MISCELLANEOUS

Bolt Cut, 1" Landis Lead Scr.
Die Filer, No. 5 Thiel, m.d.
Gear Cut., No. 3—26"—B&S
Planer, 36x36x10' Woodward & Powell, 2 Hds.
Planer, 32x32x8' American
Riv. Hmrs. Nos. 1½B, 3A H.D., 4A Mtr. Dr. & 5A High Speed
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Saw, 6x6 Peerless Hack
Saw, No. 1 Marvel Hack, 4x4 cap.
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6' BICKFORD RADIAL DRILL
Motor driven through gear box.
36' x 12' GOULD & EBERHARDT GEAR CUTTER
BRIDGEFORD CENTER DRIVE AXLE LATHE
(Will take up to 12' x 8' Axles)
1500 lb. CHAMBERSBURG SINGLE FRAME STEAM HAMMER
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Carbon, High Speed & Tungsten Carbide Tipped Lathe Centers

THESE CENTERS ARE GROUND AND HARDENED

Taper	Whole Length	Net Prices Carbon	Net Prices High Speed	Net Prices Tungsten Carbide Tipped
1	3 5/16	$ .54 each	$1.55 each	$3.00 each
2	4 3/16	.65 each	2.25 each	5.00 each
3	5 1/4	1.10 each	3.25 each	8.00 each
4	6 3/4	1.80 each	4.25 each	12.00 each
5	8 1/2	3.15 each	8.25 each	18.00 each

NEW DRILL SLEEVES
WITH MORSE TAPER SHANK

	Net Prices
1-2 No. 1 hole and No. 2 Shank	$ .45 each
1-3 No. 1 hole and No. 3 Shank	.60 each
2-3 No. 2 hole and No. 3 Shank	.60 each
2-4 No. 2 hole and No. 4 Shank	.75 each
3-4 No. 3 hole and No. 4 Shank	.75 each
2-5 No. 2 hole and No. 5 Shank	2.00 each
3-5 No. 3 hole and No. 5 Shank	2.00 each
4-5 No. 4 hole and No. 5 Shank	2.00 each
4-6 No. 4 hole and No. 6 Shank	7.00 each
5-6 No. 5 hole and No. 6 Shank	7.00 each

NEW
SLEEVES WITH BROWN & SHARPE TAPER

Inside	Outside	Our Price Net Each
4	7	$2.00
5	7	2.00
7	9	3.75
7	10	4.00
7	11	5.00
9	10	4.50
9	11	5.50
9	12	7.25
10	11	7.50
10	12	7.50

Morse Inside	B & S Outside	Our Price Net Each
2	9	$2.75
3	10	3.75
3	11	4.50

VICTOR MACHINERY EXCHANGE, Inc.
251 CENTRE STREET **NEW YORK CITY**

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DIAMOND POINT
EMERY WHEEL DRESSERS

A very efficient tool for dressing Emery Wheels.
Diamonds are mounted in 7/16" diameter rods 6" long.

¼ KT. FOR USE ON 6" DIA. WHEELS OR SMALLER
$3.00 each net

½ KT. FOR USE ON 8" DIA. WHEELS OR SMALLER
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¾ KT. FOR USE ON 10" DIA. WHEELS OR SMALLER
$7.50 each net

1 KT. FOR USE ON 12" DIA. WHEELS OR SMALLER
$10.00 each net

1½ KT. FOR USE ON 24" DIA. WHEELS OR SMALLER
$15.00 each net

2 KT. FOR USE ON 30" DIA. WHEELS OR SMALLER
$20.00 each net

MOUNTED FREE IN ANY DESIRED HOLDER

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VICTOR'S BARGAINS IN

Tungsten Carbide Tipped Tools

Price $1.00 Each In Any Size

New Low Prices. — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

SEND FOR OUR CIRCULARS

Victor Machinery Exchange, Inc.

251 CENTRE STREET **NEW YORK, N. Y.**

Air Compressor, 7½ HP motor 3/60, (near new)
Air Compressor, 8x8 Bury type HL., BD.
Air Compressor, 12x10 Bessemer 232 CFM. BD.
Air Comp., Cent., 15,000 CFM., motor 3/60. (2)
Air Comp., Cent., 10,500 CFM, G.E., motor 3/60/440
Air Comp., Cent., Ing. Rand 10 HP. motor 3/60/220
Bolt Threader, 1½" Landis, Sgl. Hd., lead screw motor 3/60/220V
Buffer and Grinder, ½ HP. U.S., 1 ph./60
Buffers, 5 HP. B&D., Hvy. Duty, 110 V. DC. 2400 rpm. (2)
Cold Saw, No. 7 Espen-Lucas, 24" blades, B.D.
Draw Bench, cap. 1½"x20' W-F. for MD.
Drill, Radial 2½' Fosdick and Holloway, BD.
Drill, double end, Natco, horiz., type S-S
Drill, Sens. No. 4 Avey, single spindle, ball bearing, on column
Engine Generator Set, 22½ KW. Wghse, 125 V. DC., Gas Engine
Filing Machine, No. 2 Cochrane-Bly, Belted
Grinder, disc, No. 26 Besley, dbl. opposed, b.d.
Grinder, Internal No. 23 Baxter, 17" spindle
Grinder, Surface No. 1 Diamond Mag. Chuck MD.
Grinder, Surface, 12" P&W. Chuck MD.
Hack Saw, Peerless 9x9" Gear box, motor 3/60
Hammer, 100 lb. Bradley "Compact," motor 3/60
Hammer, 300 lb. Bradley upright helve, m.d.
Hammer, Steam Drop 1000 lb. Chbg., D. F. cyl. 8" dia. x 42" str.
Hammers, SF., Steam or Air, 1100, 1500 & 2000 lbs.
Hoist, 5-Ton Shaw-Box Monorail 3/60
Hoist, chain, 3-Ton Superior triple geared
Lathes, bench Rivett No. 505 compound slide, draw-in attach., collets, B.D. (4)
Lathe, bench, for jewelers' use
Lathe, bench, 8"x30" Ames, collets, thrd. att.
Lathe, bench, No. 4 Rivett, collets
Lathe, 12"x8' geared head, with motor 3/60
Lathe, 18"x8' Superior QCG., 3-step cone, dbl. back geared
Lathe, 19"x14' LeBlond, QCG., Chuck, DBG.
Lathe, 42"x16' New Haven, DBG., Cone,BD.
Motor, 10HP. C-W. 230 V. DC., 1400 Rev., (new)
Pipe mach., 6" Landis, motor 3/60. (modern)
Planer, Crank 20x20x24 Cincinnati 1 Hd., BD.
Press, punch type, Wells, stroke 1¼", wt. 2500 pounds
Press, Punch or Horn, No. 116 Niagara, Grd., Str. 1½", M.D.
Press, SS., Bed 24x24, 4" str., BG., Wt. 6000 lbs.
Punch, S.E., No. 7 L.&A., 4" tht., belted md.
Punches, gang 36" No. 6 Niag.; 48" Bertsch, M. D.
Reaming Machine, horiz., 2 Delta opposed heads, two motors ¾ h.p. of 1/60/110 volts
Riveter, 2-A High Speed for M.D.
Rod Bench, 4 spdl. Broden 26" blocks with gear reduction for m.d.
Rotary slitter, 36" Yoder, cap. 5 cuts 11 ga. m.d.
Sand Blast, Pangborn AU-3 (near new)
Shaft Straightening Mach., No. 3-A Grier Hard
Shaper, 16" Stamco, V-ram, b.g., hvy. duty, cone dr.
Shaper, horiz. 7" Rhodes, self-contained motor drive, 3/60/220
Shear, squar. 43"x14 ga., PS&W. holddown, s.p.d.
Shear, splitting, 18" tht., 8" blade, cap. ¼", m.d.
Shear, plate, 156"x¼" Hyde Park, 18" gap, m.d.
Shear, plate, 126"x¼" Hyde Park, 16" gap, m.d.
Shear, Rotary No. 15-A Niagara, with circling attachment
Shear, 30" Niagara Power Squar. cap. 22 Ga.
Tapping Machine, 2" Acme 6-spdl., semi-auto. with motor
Thread Miller, Smalley General 12x36", MD.
Threading Mach., Auto. 2" Rickert-Shafer, boring & Chamfering tools, M.D.
Turret Lathe, No. 1 B&O Air Chuck, C-O, BD.
Welder, Butt, Taylor-Winfield, 20 KW., 220 v.
Welders, Butt 200 & 300 KW. Winfield 60 cy., 400 V.
Welders, Seam, 125 KVA. Thompson, 60 cy. 220 V.

PRESS, Hydraulic, 250-Ton, 4-posts, platen 148"x52", daylight 108", stroke 40", water pres. 2500 lbs. Wt. 130,000 lbs. Near new (2)

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GRINDERS
14"x48" Modern Universal, cylindrical pwr. fd., comp.
No. 1 LeBlond & Cin. T & C
16"x48" Landis, c/s self. c.
No. 3 Univ. D&K, Tool, Cut.

LATHES
(2) 1" Hardinge Prec. Tur.
16x8 & 18x10 South Bend
(2) 15x6' Rockford, Q.C.G.
(2) 17x9 Sidney, Q.C.G.
20x10 Walcott, Q.C.G.
22x11 Cisco Q.C.G. M.D.

MILLING MACHINES
No. 3 Rock. Prec. Hand
No. 5 Becker Vertical, all power. fds., rotary table, with P.F. M.D.
No. 1½B, K. & T. dble. ov.
No. 2 Becker, vert. pwr. fd.
No. 2 K & T Plain, Compl.

SCREW MACHINES
1" Milholland, bar fd. col.
No. 0 Foster, bar feed, col.
No. 1 Foster, bar feed, col.
No. 1 B. & S. semi-automatic collets die heads
No. 00 B&S automatic, comp.
No. 3 Foster, B.g.; Fric. hd. P. Fd.
No. 4 Milholland B.g.; Fric. hd.; P fd.
1¼" Smur Kaman, compl.

MISCELLANEOUS
Brake 5' D&K 14 ga., cap.
Radial Drill, 3' Gang, T.A.
6"Victor Pipe Mach., Dies
Planer, 36"x36"x10' N.B.P.
Shapers: 7" to 24"
10 & 15 KVA Spot Welders
No. 2 LaPointe Broach

GILMORE MACHINERY CO., 30 S. Clinton St., Chicago

ATTENTION SMALL TOOL BUYERS

We Are Placing On Sale An Overstock Of New, First Quality Small Tools Carbon Taps, Drills, H. S. & Carbon Reamers, Button Dies, Chasers, Files, Lathe Tool Holders, Steel Gears, Gear Racks, Lead Screws, End Mills, Hollow Mills, etc.

NOTE—We Guarantee Every Item Listed Below As "New" To Be Of First Quality And Of Well Known Make. Check Carefully.

NEW PRATT & WHITNEY CARBON TAPS

QUAN.			
200	3/16"x32	Nut Taps 4¾" long, doz.	$2.75
2500	1/4" x28	Nut Taps 5¼" long, doz.	$2.85
200	1/4" x28	Tapper 11" to 14" doz.	$3.00
1500	5/16"x24	Tapper 11" to 14" doz.	$3.35
2400	3/8" x24	Nut Taps 6" long, doz.	$3.80
1200	7/16"x20	Nut Taps 6½" long, doz.	$4.30
700	7/16"x20	Tapper 14" long, doz.	$4.50
350	7/16"x14	Tapper 11" to 14" doz.	$4.50
500	9/16"x18	Tapper 12" to 14" doz.	$5.00
200	9/16"x12	Tapper 14" long, doz.	$5.00
200	5/8" x18	Tapper 12" long, doz.	$6.00
400	21/32"x11	Tapper 11" long doz.	$6.00
700	11/16"x11	Tapper 9½" to 14" doz.	$6.25
500	11/16"x 9	Tapper 11" long, doz.	$6.25
200	13/16 x10	Tapper 10½" long, doz.	$6.50
75	7/8" x18	Tapper 10" to 14" doz.	$9.00
100	Dozen 9/16"x12	J.M. Carpenter Plug Taps, regular, 1 doz. in box	$3.00

CHECK THIS—8 only H.S. one side Milling Cutters, 8½"x1-1/16"x45°x2" Arbor hole, L.H. 30 teeth. a valuable tool, ea. .....$20.

NOTE—We have on hand about 1500 ass'd. H.S. Stub Screw Machine Reamers from 5/32" to 1" R.H. with L.H. spiral flute and L.H. with R.H. spiral flute, shanks 5/16", ⅜" & ½" length overall 2" to 3", send for details.

NEW—90 doz. Power Hack Saws 12"x1" doz. $3.50
250 Doz. 14" Flat Mill Bastard Files, single cut, new, first quality Doz. $3.50
100 Doz. 6" Slim Taper Saw Files Doz. $1.20
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250 Oil Stones (Hones) 1"x2"x8" Fine, Med., Coarse ea. .....50c. Combination ea. .....60c.
200 Quires (24 sheets) Alum. Oxide Cloth, 9"x 11" Grades 100, 120, 150, 180. Quire $1.00

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C. & W. TOOL CO. SUPER SPIRAL

ADJUSTABLE HAND LINE REAMERS. NEW. VALUES TO $15.

QUAN.						EACH
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SPECIAL—60 NEW 1" H.S. REAMERS, R.H. Spiral Flute, 3" long, No. 3 Morse Taper, length overall 11" while they last ea. $5.00

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90, Double End End Mills, H.S. 6 Flute, ¼" Radius, 2½" long, body 15/32" for chamfering Gear finishing, centering ea. $1.00

200, 5/32" 3 flute H.S. Hollow Mills, 1" long. ⅜" Dia. slotted for collar adjustment, ea. 75c.

NEW Carbon Drills St. & Taper Shank priced at less than half of wholesale price.

			NET
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14	1-13/16"	#4 Morse taper, list 14.00	4.00
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14	1- 5/16"	#4 Morse Taper 6.00	1.75
8	1¼"	S.S. Taper Length 8.50	2.50
12	1-15/32"	Taper Length 8.00	2.25
10	1- 7/16"	Taper Length 7.50	2.20
10	1- 5/16"	Taper Length 6.00	1.75
10	1- 3/8"	Taper Length 6.50	1.90
12	1-13/32"	Taper Length 7.00	2.00
10	1-11/32"	Taper Length 6.25	1.85
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Lo-Swing 4"x36", 4"x60", 4" & 8"x108"

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Milwaukee No. 3 Vert. Motor in Base
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Terkelsen D-1 150 t. M. Spring
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W-F Type for cartridges (20)
W-F 3000 Ton Hyd. Hobbing
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Broaches, LaPointe 1-2-3-4L
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26"x14' Niles, PCG
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2x24" Jones & Lamson
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No. 5 Becker vertical
No. 7H Becker production
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72x72x17' Detrick and Harvey planer
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2—No. 5A Potter & Johnston automatic turret lathes, serials over 20,000, with 5 station turret, hole through spindle 1 9/16"
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2—12x36" Cincinnati univ. grinders, arranged for 3 m.d., complete with motor driven headstock, motor for the grinding wheel slide and motor for the table feeds
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1—No. 12 Brown & Sharpe pl. cyl. grdr., bd., max. grdg. dia. 8", max. grdg. length 36"
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1—8" Arter Rotary surf. grinder, with equip. for Piston ring grinding, dia. of chuck 8½"

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PLANERS

1—36"x36"x10' Niles dbl. housing planer, b.d. 2 heads on cross rail, 2 side heads
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MISCELLANEOUS

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1—Oliver Twist drill grinder
1—No. 0 LaPointe broaching machine, max. stroke 21"

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GRIDLEY 4 SPDL., ¾" CAP.
B. & S. CUT OFF No. 0, H. S. OVERSIZE
SPDL. WIDE CROSS SLIDES, REBUILT
CLEVELAND MOD. A, 3¼" SER. 33000
CLEVELAND MOD. B, 1¼" SER. 21970
18" FEED
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No. 3 Bardon & Oliver, Bar, Pwr. to Turret
No. 3 Foster, Bar Fd., Pwr. to Turret
No. 2 Woods, Bar Fd., Collets & Tooling
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1" — 2" — 3" Depth

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14"x8' Hendey, M.D., Taper Attachment
19"x10' Flather, Q.C., 2 Chucks

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No. 70 Heald, Internal

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No. 3A BROWN & SHARPE UNIV. ALL GEARED HD., S.P.D. DIV. HD.
No. 2 Kempsmith Plain, M.D.
No. 2 Cincinnati Universal, M.D.
No. 1½ Brown & Sharpe Univ., Vert. Att.
No. 000 B. & S. AUTO. MILL, 3 MOS. OLD (COMP.)

MISCELLANEOUS

Brown & Sharpe 3"x36" Auto. Gear Cutter
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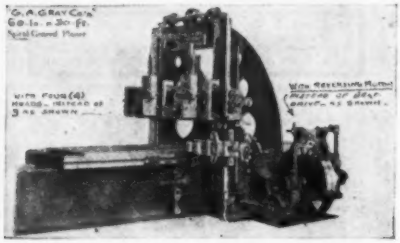

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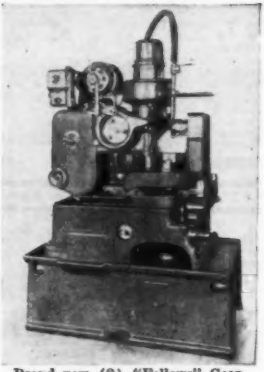

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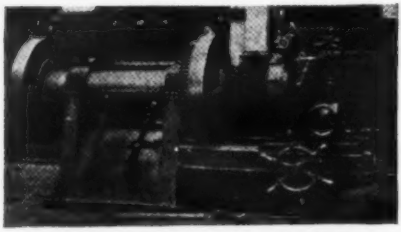

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18"x36" Waterbury-Farrel
CLEVELAND SINGLE SPINDLE SCREW MACHINES
⅞"-1¼" Model "C"
1¼" Model "A"
1¼"-1½" Model "B"
2¼" Model "A"
3—2¼"-3¼" Model "A"
2¾"-4" Model "A"
NATIONAL ACME SCREW MACHINES
2—No. 53 Four Spindle
SHAPERS
16" Steptoe Crank
6" Pratt & Whitney Vertical
SLOTTERS
8" Betts Vertical
15" Newton Vertical
TURRET LATHES
1"x10" Pratt & Whitney
Several 2¼x24 Jones & Lamson
Several 3x36 Jones & Lamson
No. 3 Foster Geared Friction Head
Several 3¼x36 Acme Geared Head Univ.
24" Gisholt
MISCELLANEOUS
1½" Landis Double Head Bolt Threader
8'x¼" Robinson Press Brake

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3" Bar, Floor type-cross tbl.
4" Bar Niles, Knee type
34" Gish., 1 Hd. Rap. Trav.
52" Rodgers Vertical 1 head
HOBBERS & GENER'S.
5A Lees-Bradner S.P.D.
6", 11", & 18" Gleason gr.
26" Rhenania
LATHES
9" Sundstrand Prod. S.P.D.
14x6 American, Q.C.G.
14x6 Monarch, QCG Gr. Hd.
16x8 Lodge & Shipley, QCG.
18x8 LeBlond L.C.G.
18x10 South-B, Q.C.G. T.A.
24x8 Sch-Boye, Q.C.G. T.A.
24x12 Sch. Boye Q.C.G. Tap. Att.
27x16' Bridgeford—cone
34x12 Pond L.C.G.
MILLING MACHINES
No. 0 Owen. Div. Hd. & Tailstock
48" Newton Vertical Double Spindle Rotary, M.D.
Chicago & Whitney Hand
No. 21 Garvin, Cone Dr.
TURRET LATHES
No. 2 W & S. Saddle type,
No. 9 Foster, 3¼" hole P.F.
No. 2A Warner & Swasey Univ. SPD, MD., 3¼" hole
MISCELLANEOUS
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Broaches: V18 Amer.
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No. 1 Milwaukee q.h., mtr. dr.
No. 2 Cincinnati plain, p. fds., vert. att.
No. 2 Brown & Sharpe univ., div. hd.
No. 3 LeBlond plain, vert. att., mtr. dr.
No. 3 Becker, univ., div. hd., mtr. dr.
No. 3 Garvin, div. hd., 3 p. fds.

LATHES

16"x8' Hendey Lathe, gd. hd., q.c.g., box
18"x10' Amer. Tool Lathe, qcg., dir. m. dr.
18"x10' Hendey Lathe, q.c.g. box
26"x10' Whitcomb Blaidsdell Lathe, q.c.g.
28"x14' Putnam Lathe
46"x20' Fitchburg Lathe

TURRET LATHES

No. 2 Millholland, 1" bar feed
No. 5 Acme, 1½ cap., p. fd.
No. 4 Foster, 1⅝" cap., p. fd.
No. 4 Bardons & Oliver, 1½" cap., 2 p. fds.
Warner & Swasey, 2" cap., bar fd., d. mot. dr.; tool holds., coll.
No. 7 Bardons & Oliver, 2" cap., p. fd.
3x36 Jones & Lamson, s.p. drive
Gisholt, 3½" cap., 2 p. fds.

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Binsee Horizontal Boring Mach., spindle 2½", table 48x24
42" Colburn Bor. Mill, 12 spds., 2 gear box
Lucas Horiz. Boring Mill, 2¾", m.d.

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24" Gould & Eberhard Shaper, Dir. M.D.
20" Steptoe Shaper, Dir. M.D.
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Cincinnati Planer, 60x60x10, 3 heads

GRINDERS

12x36" Cinc. Grinder, univ., p. fds. thru gear box
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No. 3 Van Norman, 6"x9", internal

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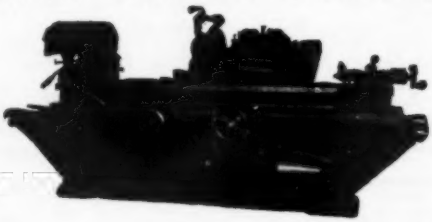

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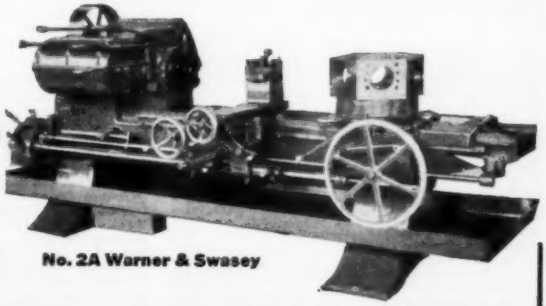

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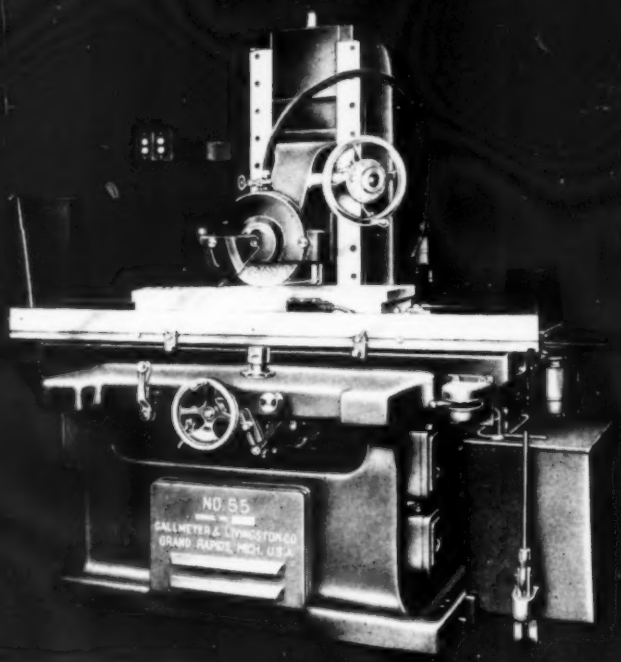

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